FACTORY

BETTER PRODUCTION AND MAINTENANCE THROUGH BETTER MANAGEMENT

FACTORY watercolor: Sun-swept plant of General Electric's Computer Department, Phoenix, Ariz.

OCTOBER 1959

PRICE ONE DOLLAR

A McGRAW-HILL PUBLICATION

SHIFT SCHEDULING ..... p. 87

Easy way to cure a bothersome management headache

HOW TO MODERNIZE OLD PLANT BUILDINGS ..... p. 92

COMING: A NEW LOOK IN LABOR LEADERS ..... p. 182

SEE the Maintenance-Cutting Quality in LUNKENHEIMER N-M-D

You can actually *see* quality in every feature of Lunkenheimer N-M-D (Non-Metallic Disc) Valves—from the exclusive Non-Slip® handwheel and perfectly-machined stem threads to the rugged bronze body.

The unretouched photo tells part of the story. But you cannot see the difference between a Lunkenheimer Valve and an ordinary valve unless you actually compare.

Your Lunkenheimer Distributor will be glad to show you the difference.

Let him match a Lunkenheimer N-M-D—part-for-part—against any valve you are using for similar service. See for yourself the precision workmanship and advanced design that pay for themselves many times over in lower maintenance costs...or write The Lunkenheimer Co., Cincinnati 14, Ohio.

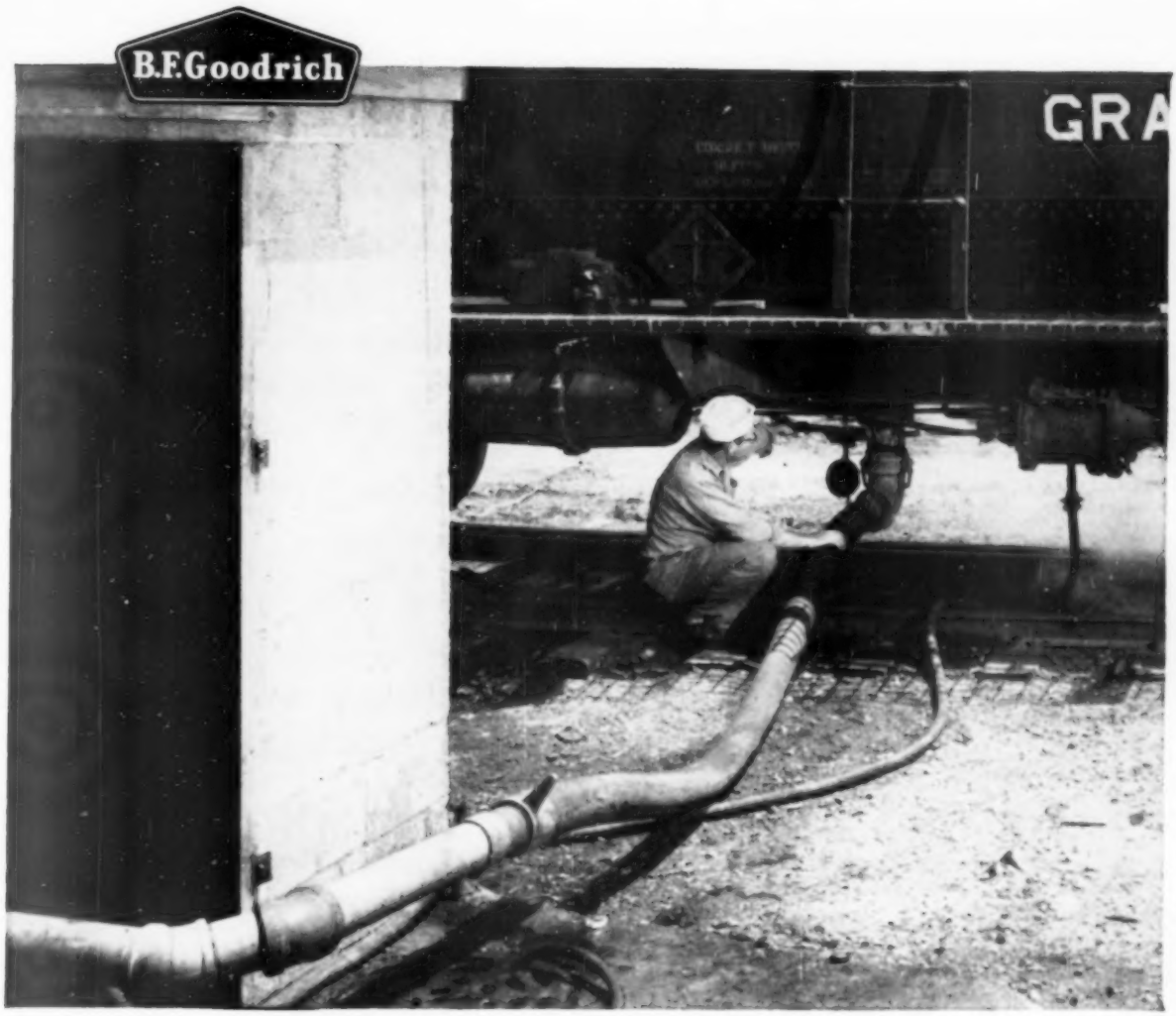
Fig. 123 N-M-D
150 lb. S. P.,
300 lb. W.O.G.

FREE Piping Practice Wall Chart on Valve Selection, Installation, Maintenance

LUNKENHEIMER QUALITY

LUNKENHEIMER®
THE ONE *Great* NAME IN VALVES

For more facts circle 446 on READER SERVICE CARD



Pass the syrup— a carload at a time

B.F.Goodrich improvements in rubber brought extra savings

WORKERS at this candy company were having a terrible time unloading corn syrup through metal pipe. Getting the tank car in just the right spot to make the hook-up took a lot of time. The rigid pipe was heavy, hard to maneuver, a strain to connect.

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THE MAGAZINE OF PLANT OPERATING MANAGEMENT

Edited exclusively for the men with management responsibility for production and maintenance in the manufacturing industries

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THIS SIMPLE FILING SYSTEM is designed to give quick access to past FACTORY articles that can help you solve current operating problems. Here's how it works:

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For ways to use this tool, plus an outline for a complete decimal filing system, check square at top of Reader Service Card, next to back cover.

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1.1 Management and Practices

1.2 Buildings and Yards

1.3 Services and Facilities

1.4 Electrical Services

2.0 Production

2.1 Management

2.2 Production Controls and Systems

2.3 Methods and Technology

2.4 Material Handling and Plant Layout

3.0 Plant Management

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No other truck in the 12,000 to 20,000 lb. capacity range can match the new TITAN for maneuverability. Built to operate through box car doors, the TITAN is ideal for car loading and for handling in narrow or congested aisles.

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THE GREATEST NAME IN RUBBER

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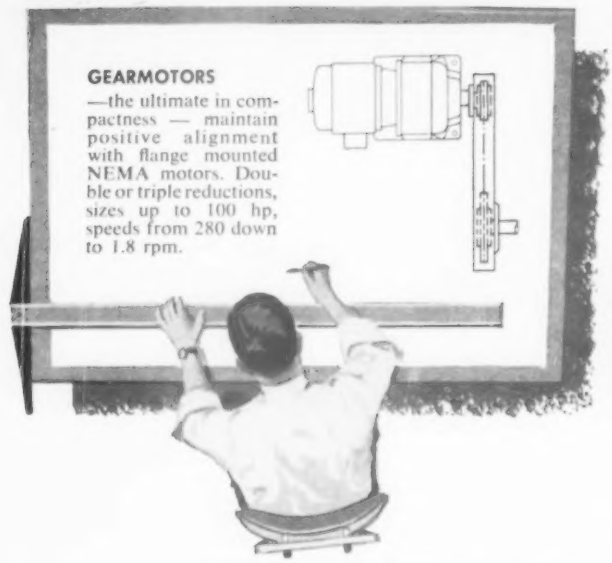
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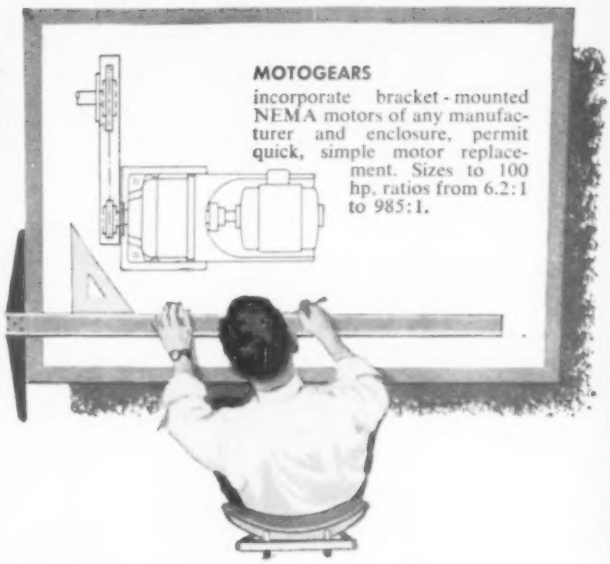
MOTOGEARS
incorporate bracket-mounted NEMA motors of any manufacturer and enclosure, permit quick, simple motor replacement. Sizes to 100 hp, ratios from 6.2:1 to 985:1.

It's industry's only complete line—

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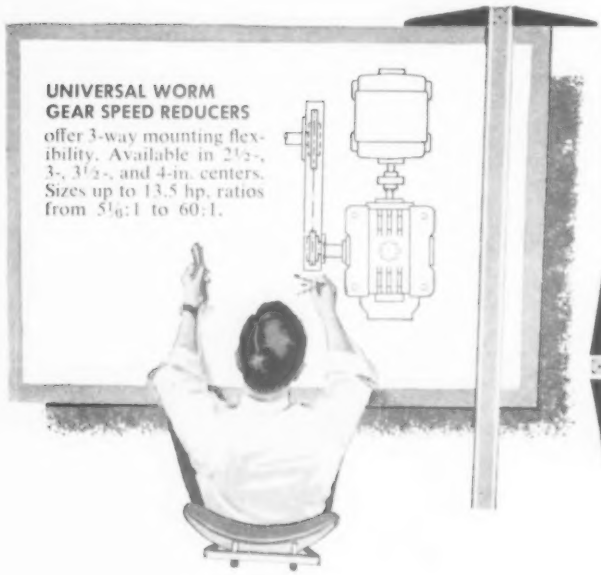
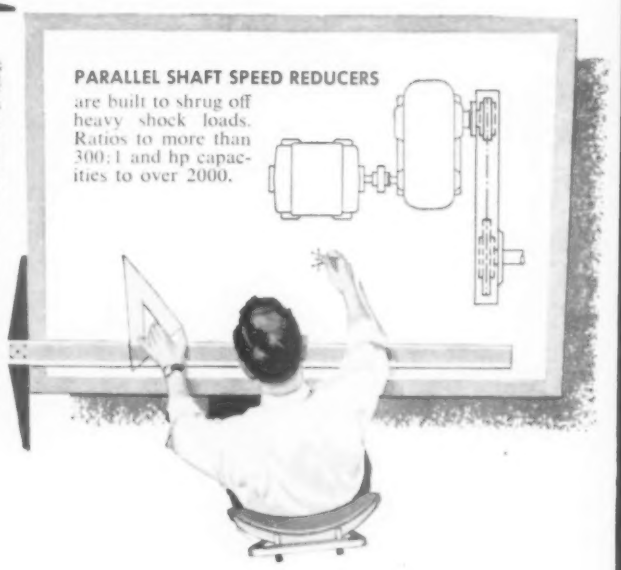
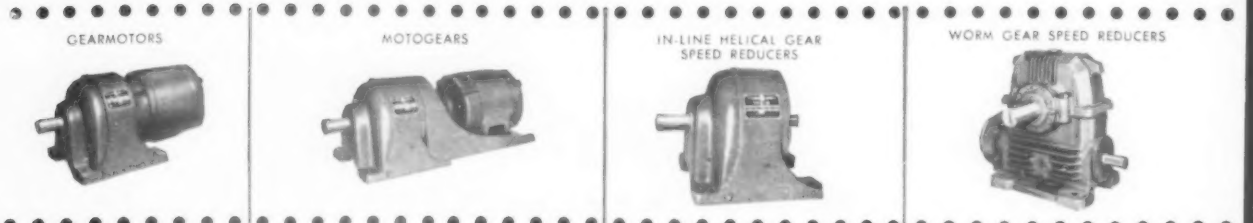

UNIVERSAL WORM GEAR SPEED REDUCERS
offer 3-way mounting flexibility. Available in 2½-, 3-, 3½-, and 4-in. centers. Sizes up to 13.5 hp, ratios from 5⅓:1 to 60:1.


PARALLEL SHAFT SPEED REDUCERS
are built to shrug off heavy shock loads. Ratios to more than 300:1 and hp capacities to over 2000.



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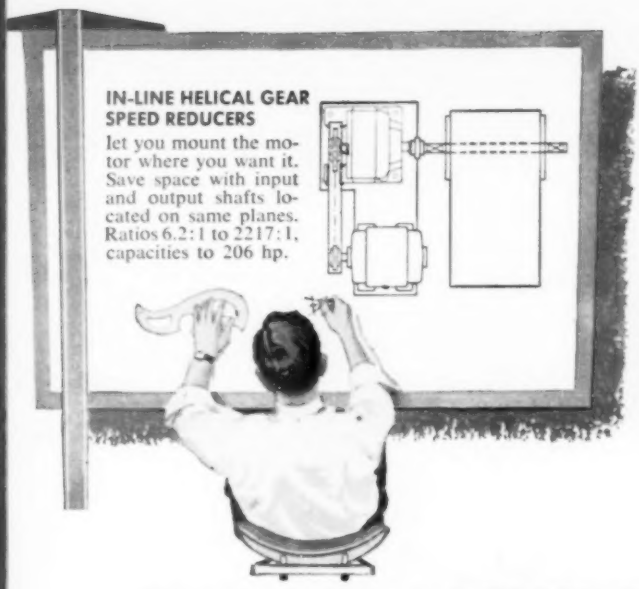
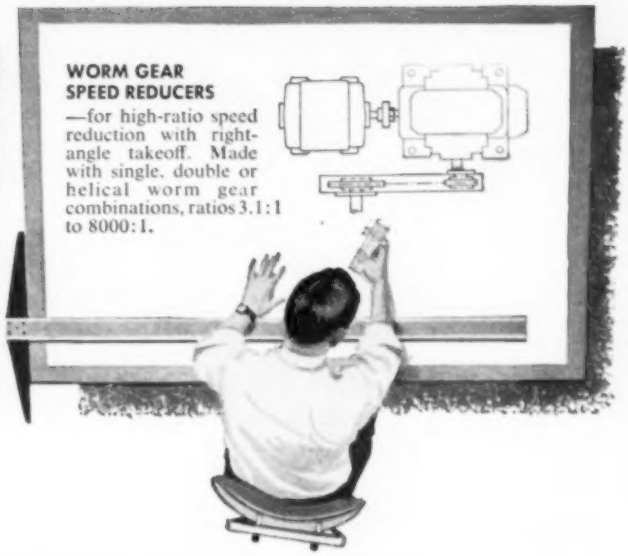

IN-LINE HELICAL GEAR
SPEED REDUCERS
let you mount the motor where you want it. Save space with input and output shafts located on same planes. Ratios 6.2:1 to 2217:1, capacities to 206 hp.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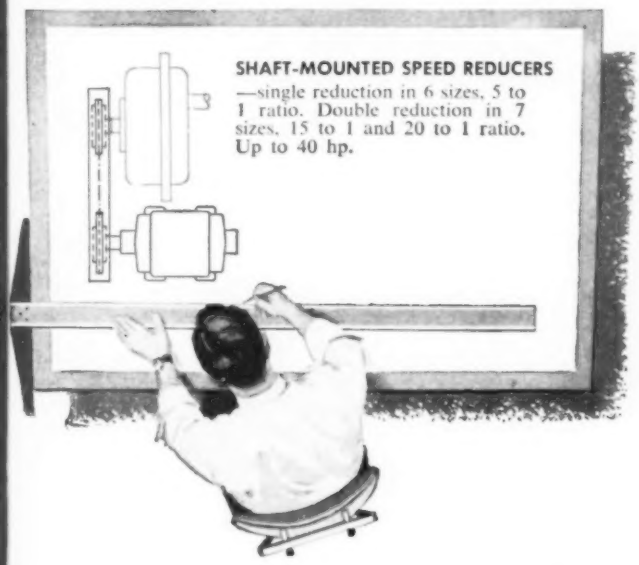
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FACTORY LETTERS

ARBITRATION EVIDENCE

Sir:

In a recent arbitration case between the General Electric Company and the IUE-AFL-CIO, a reprint of "The Truth About Wage Incentives and Work Measurement Today" from the April 1959 issue of FACTORY was used by the Company as one of several exhibits to indicate the growing use of predetermined time standards in industry.

Mr. Bertram Gottlieb, witness for the Union, later testified he had met with FACTORY editors and discussed this article. I am attaching a copy of his testimony which contains statements about the article. Would you care to comment?

W. T. Short
Manager, Methods and Time
Standards Service
Manufacturing Services Division
General Electric Co.
Schenectady 5, N. Y.

► We're pleased to know that FACTORY's survey on wage incentives and work measurement was introduced as an exhibit in your recent arbitration case with the IUE-AFL-CIO. We are shocked, however, to find that Mr. Bertram Gottlieb, a witness for the Union, presented so much testimony regarding it that is misleading and filled with untruths and half-truths.

First let us reassure you—and

Turn the page

FACTORY

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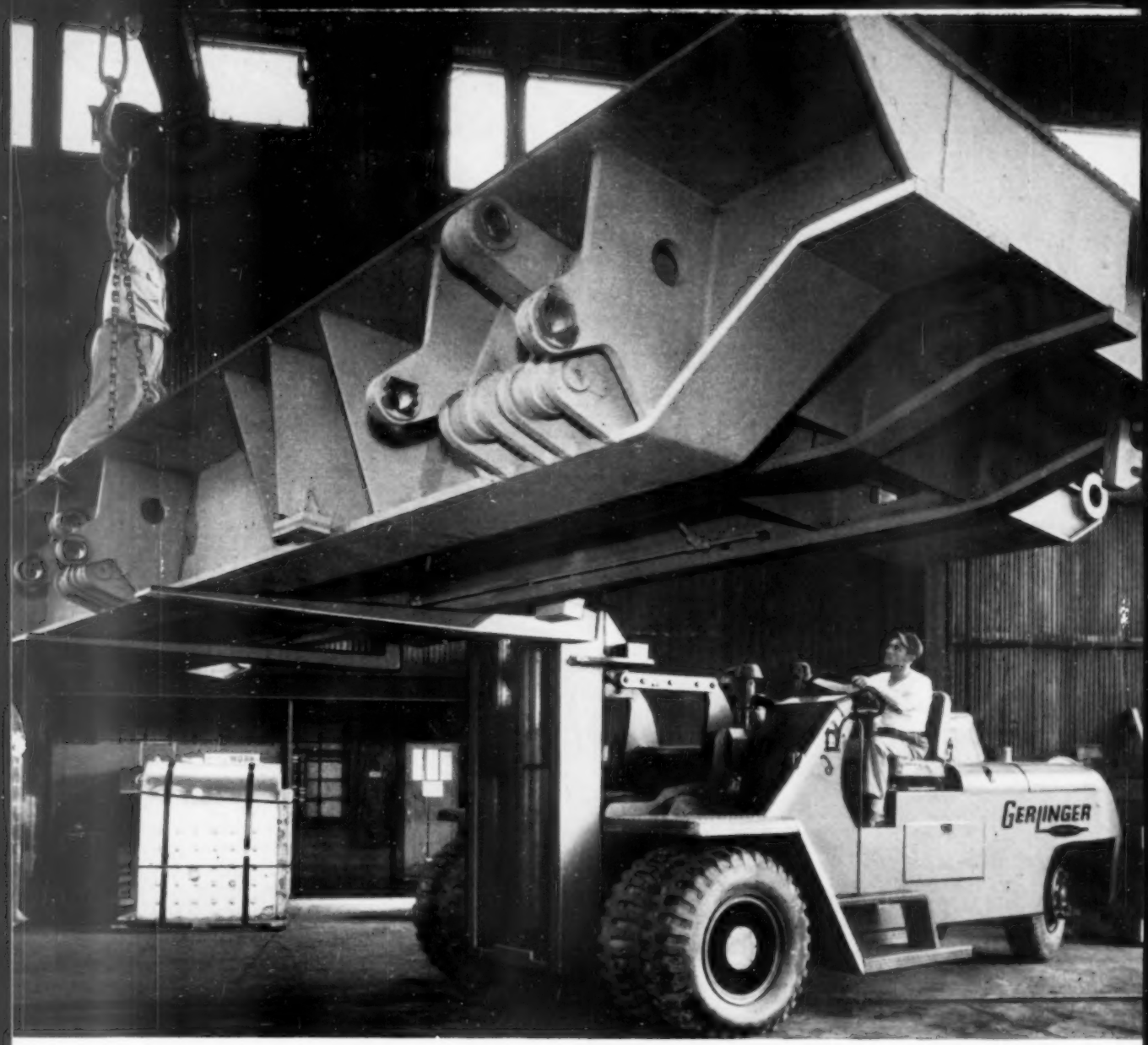

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Faultless
Casters

L900
DOUBLE BALL BEARING SWIVEL
MEDIUM DUTY

CUT YOUR HANDLING COSTS 3 WAYS

Faultless Casters

SUPERIOR DESIGN FEATURES

1. CORRUGATED TOP PLATE . . . fully hardened to give added strength. Slotted mounting hole spacing permits easy attachment.
2. MAIN LOAD BEARING . . . consists of 21 hardened, polished balls (⅜" dia.) rolling in large dia. hardened, lubricated raceway permanently attached to caster horn to assure perfect alignment.
3. LOWER THRUST BEARING . . . contains 10 hardened steel balls (⅜" dia.). Hardened raceway is machined from bar stock. Ball retainer is hardened formed steel.
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ASK YOUR DISTRIBUTOR! Your Faultless Industrial Distributor will be glad to serve as your expert on casters and wheels. He stocks Faultless Casters and is prepared to offer "plus value" by recommending the right type, load capacity and wheels to suit your requirements. He is listed in your phone directory under "Casters."

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Evansville 7, Indiana

Send me Free L900 Medium Duty Caster information.

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Begins on page 8

any other interested parties—that this survey as reported in FACTORY was designed, executed, and analyzed in the same unbiased and professional manner in which FACTORY has conducted such surveys for over 60 years. The care and judgment with which we conduct these surveys has earned us a reputation for authority and integrity. This survey is no exception.

As clearly stated in our article, FACTORY actually made two surveys of wage incentives and work measurement. The first, with 37 questions, was mailed to a systematic sample of 4000 manufacturing plants with over 250 employees in all industries. This brought 511 replies. A second survey (a brief questionnaire designed to verify returns from the longer questionnaire) was mailed to a similar sample of 1000 plants. It drew 274 replies.

What was significant to plant operating people who are concerned with wage incentives and work measurement (and what convinced FACTORY's editors and its readers of the validity of the study) was the fact that 59% of the respondent plants on the first survey said they had work measurement and 61% on the second survey said they had work measurement. This correlation is almost too good to be true. Similarly, 49% of the respondents of the first survey said they had wage incentives; 54% of the respondents of the second survey said they had wage incentives—another good correlation.

From this point forward in our survey we based tabulations and conclusions upon the detailed information gleaned from the first survey. The basis for calculating percentages logically was less than the 511 total returns. There were two reasons:

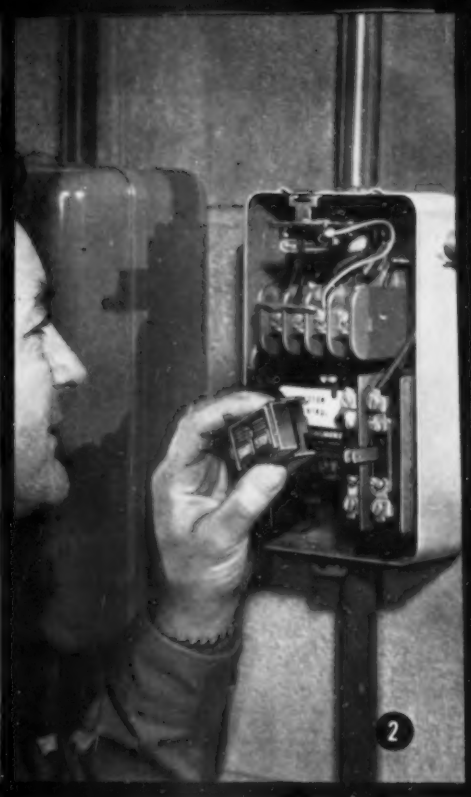
1. Of the 511, only 306 plants actually had work measurement.

2. In some cases, the respondents either did not reply to a specific question or furnished an answer that was judged to be so far from the norm as to represent a mistake in interpretation on the respondent's part. However, in all cases FACTORY published in bold-face type the actual base used.

Turn the page

For more facts Circle 455 on Reader Service Card

Flexible Design for Easy Modifications



NEW complete line of low voltage motor control

The modern, flexible design of this new line of Size 0 through 4 Allis-Chalmers control permits making many modifications in the field with ease. Minimum parts requirements facilitate delivery from local stock.

1. A third overload relay can be added to any Allis-Chalmers enclosure in the field, by use of just two screws.
2. Start-stop buttons and selector switch kits are "plug-in" mounted.
3. Only one pilot light kit is needed for any size starter, any standard voltage.

• Auxiliary contacts fit any size starter, 0 through 4.

Accessibility — Wide-open design permits fast installation, modification, inspection and maintenance.

Unsurpassed Mechanical and Electrical Life — Millions of "life test" operations attest to the functional quality in every detail — assure the ultimate in dependable performance and sure protection for personnel, motors and machines.

A complete line of low voltage control (Size 0 through 8) and high voltage control *in all NEMA* enclosures, plus engineered control systems. Your A-C distributor or representative will give you all the details. *Or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.*

ALLIS-CHALMERS

A-5985

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4 do the work of 6

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V-BELT DRIVES
deliver 40% more H.P. per belt!

MANY SAVINGS . . . Sheaves can be smaller, lighter, the drive more compact, and belting costs sharply reduced by the use of today's Dickrope "QD" V-Belt Drives. Reduced initial costs . . . increased belt life . . . savings on maintenance and space.

"TEMPERED" CONSTRUCTION . . . a pacesetting advance that increases belt h.p. rating 40%, minimizes stretch, increases resistance to abrasion and shock, adds flexibility. Smooth vibration-free operation is assured by freedom from surface irregularities and by the Dick "QD" sheave . . . precision made, tight fitting, easily installed and removed.

Prompt, off-the-shelf delivery of belting and sheaves to meet practically every drive requirement.

NEW . . . A Necessary Reference Manual

Send coupon for our new "Engineering Manual — Dickrope 'QD' V-Belt Drives" . . . the most complete and up-to-date in the field.

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Dept. 15-J
Totowa, New Jersey

Without charge or obligation to me, please send a copy of your new "Engineering Manual — Dickrope 'QD' V-Belt Drives."

Name _____

Position _____

FACTORY / LETTERS

Begins on page 8

In his testimony before the arbitrator, Mr. Gottlieb made much of this elimination of a few replies. We wonder why—since this is a time-honored practice in statistical analysis, in survey analysis, and in work measurement itself. In time study, for instance, we all know the time-study engineer eliminates erratic readings before striking his average. What *is* important is that the great percentage of responses to FACTORY's survey were accurately represented by the percentages published by FACTORY.

FACTORY makes no claim of having designed a perfect questionnaire. In fact, we make no claim of having conducted a perfect survey. But we do know, because we checked it with dozens of professional industrial engineers, that the questionnaire was a good one and that the survey is a good and reliable one.

As Mr. Gottlieb also testified, he visited FACTORY's office to discuss his criticism of the survey with us. In representing his conversation with FACTORY's editors to the arbitrator, Mr. Gottlieb did not present reliable testimony on many occasions. We are sorry if Mr. Gottlieb received his erroneous impressions at our office. All we know is that we discussed the survey with him openly and forthrightly.

FACTORY's office is always open to people seeking information. It is still open, even to Mr. Gottlieb. But our questionnaires are *never* open to anyone except FACTORY editors. The respondents' replies are confidential. This is the promise we make to the plant operating people everywhere who have cooperated so generously in our surveys. We respect this pledge, and we keep it.—ED.

ARDEN HOUSE APPLAUSE

Sir:

I have just read your article on Arden House ("A Brand-New Break-through in Management Development") in the July issue of FACTORY, page 74. Enthusiastic congratulations are in order.

I'm informed many notable literary personnel had attempted to

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Basic UNI-FRAME lens box
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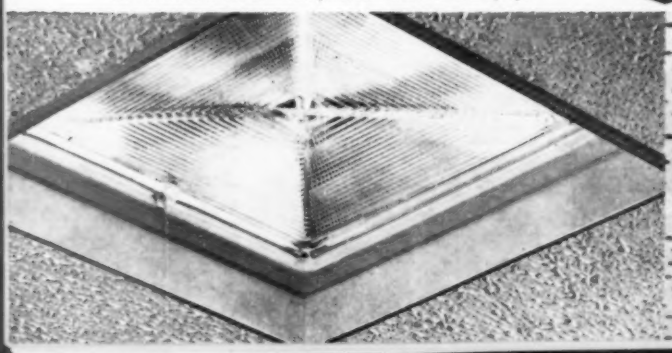
Diffusing Glass Bowl of Double-Tuf* ceramic-coated PYREX*

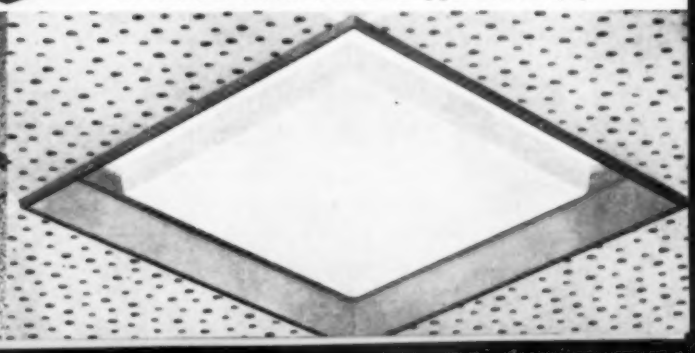
Prismatically-accurate Flat Lens of fully tempered PYREX*

*Reg. Trade Mark of Corning Glass Works

12" white UNI-FRAME with prismatic flat lens and splay.

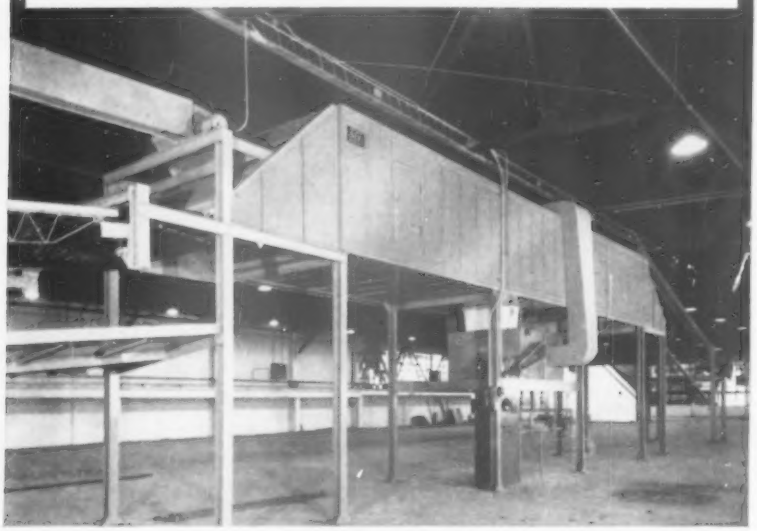


10" brass finish UNI-FRAME with diffusing glass bowl and splay.



SLY INDUSTRIAL OVENS

Heavy Duty for All Needs



Sly Ovens insure better results, greater overall economy through efficient air distribution . . . close temperature control . . . maximum heat utilization . . . time-saving materials handling . . . space-saving installation. Like the "A" type oven pictured, all Sly Ovens are expertly designed and sturdily constructed to meet the particular job requirements. A complete line of conveyorized and batch types for all applications to 800° F.

See SLY for Savings Down the Line

DUST CONTROL SYSTEMS
Unequaled experience in system design plus the most extensive dust filter line. *Dynaclone* and *Automatic-Continuous* for uninterrupted, 24-hour-a-day service. *Intermittent* for non-continuous applications. Plus *"Unit"* and *"Economy"* filters.

INDUSTRIAL OVENS
Conveyorized and batch type for better results and increased savings on all baking, drying, finishing, and aging applications.

ROD BAKERS
Pit type in complete range of sizes. Reduce drying time of lime-coated rods from 30 minutes to 5. Designed to save space and coil handling time.

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Continuous and batch type. Remove fins as they clean castings — saving hours of machining.

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In all types and sizes, with full mechanical return of abrasives. Thoroughly ventilated. Built to withstand years of heavy use.

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Complete protection against even the finest dust. Lightweight, comfortable. Maximum visibility, complete freedom of head movement.

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Steel with tungsten carbide orifice lining outlasts hard iron nozzles 200 to 1. For shot, grit and sand blasting.

PLUS . . .
Wear-resistant "Slyblast" hose. "Purair" blower units. Air pressure regulators. Abrasive elevating and cleaning units. Pressure blast tanks. Blast cabinets. Tilted blast mills. Gloves, aprons, canvas suits, leggings.

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Begins on page 8

recapture the Arden House climate but their work never passed the scrutiny of National Training Laboratories' Dr. Lee Bradford. Therefore, I sincerely congratulate you on not only doing an excellent job in re-creating the Arden House situation in your article, but succeeding where others have failed.

Victor G. Smith
Manufacturing Supt.
Beltone Hearing Aid Co.
Chicago 32.

Sir:

I was very impressed with your article in July FACTORY on the management training course at Arden House. Would it be possible to obtain further information?

G. J. Dunne
Production Manager
Frank W. Horner Limited
Montreal 1, Canada

Sir:

I have read with interest the article on Arden House in the July issue of FACTORY. Would greatly appreciate any further information you can supply us regarding this laboratory.

E. J. Deadrick
Plant Manager
The Audio Manufacturing Corp.
Glenbrook, Conn.

► The above are only a sample of the complimentary letters we have received on George A. Hoy's Arden House article. We're delighted with the response. Those wishing further information may obtain it from Dr. Leland P. Bradford, Director, National Training Laboratories, 1201 Sixteenth St., Washington 6, D. C. Incidentally, we still have a few reprints available at 50¢ each. Write to Reader Service, FACTORY, 330 West 42nd St., New York 36.—ED.

CORRECTION

On page 84 of our August issue ("Your Winning Ticket in 1960") we listed FACTORY's current circulation as 70,000. This was a round figure. For the sake of complete accuracy, here's an exact figure: As of June 30, 1959, the Audit Bureau of Circulation listed our circulation as 67,454.—ED.

For more facts Circle 459 on Reader Service Card

B.F.Goodrich

News from your TIRE AND WHEEL ANALYSIS MAN

4 reasons for choosing All-Purpose pneumatic tires

If you use pneumatic tires on your materials handling equipment, consider these 4 facts: (1) B.F.Goodrich All-Purpose pneumatic tires give extra traction on all hauling surfaces. (2) They protect floors from damage. (3) Operator fatigue and equipment maintenance are reduced. (4) All-Purpose tires are stronger, more stable, have hundreds of gripping edges. Ask your B.F.Goodrich Tire and Wheel Analysis man if this isn't the kind of tire you should be using.

I can save you up to 50% on industrial tire costs

All-Purpose and "wired" tires are just 2 examples of the specialized industrial tires B.F.Goodrich makes. As your trained Tire and Wheel Analysis man, I know which tires are best for you. My survey of your operation costs nothing—can pay big dividends in money saved on tire costs. Mail the coupon today for my FREE services and tire recommendations.

Specify B.F.Goodrich tires when ordering new equipment.

The wire in these tires saves concrete pipe company 200% on tire costs

Scraps of reinforcing rods used in pipe construction once caused terrific tire trouble for this Toledo, Ohio, concern. Then the B.F.Goodrich Tire and Wheel Analysis man suggested a switch to new "wired" tires—tires made with a special shield of steel wire under the tread to guard against punctures and blowouts.

Result: Tires once lasted only 6 months, but these B.F.Goodrich "wired" tires have been in constant use for 2½ years *without repairs*. Tire costs have been cut 200%. This is typical of the work a B.F.Goodrich Tire and Wheel Analysis man does. What can he do for you?

The B.F.Goodrich Company
Department TW-793, Akron 18, Ohio

- ☐ Please send me information on All-Purpose tires.
- ☐ Please send me information on "wired" pneumatic tires.
- ☐ Please have the Tire and Wheel Analysis man call.

NAME_____

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CITY_____ ZONE____ STATE_____

B.F.Goodrich *industrial tires*

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Only **ONE**

Looks like.....
Fits the hand like..
Operates in restricted space like..

A

SIOUX all-angle drill!

The SIOUX All-Angle drill is a complete departure from conventional design. It doesn't look like the others, doesn't operate like the others. It was freshly, and functionally designed to fit the hand naturally, and to work just about anywhere you can get your fist. Because it will work in so many places that conventional drills won't, it is a much more useful tool. Users of drills in every conceivable field have taken to this powerful $\frac{1}{4}$" drill with that special kind of pride, and satisfaction that men who work with tools can have for good design, and quality manufacture. They have written unsolicited letters about its good "feel;" about how they couldn't stall it even with over sized drills; about how it continued to deliver dependable day in, day out service, years after other nationally known brands purchased at the same time, had been scrapped. This is *not* just another drill. It's one of the most popular professional drills ever made!

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SIOUX *All-Angle* screwdriver

Built on the same frame as the All-Angle Drill the SIOUX All-Angle Screwdriver inherits all the advantages of lightness, power, ease of operation, and ability to work in limited space. It is immensely useful anywhere screws of any kind are driven or removed. Tightness of screw is determined by hand pressure of operator in one model, by pre-setting in another.

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TEXACO ORGANIZED LUBRICATION CAN HELP YOU . . .

End replacement parts waste

One Northeastern manufacturer replaced parts in a major machine every two weeks—a not uncommon practice in industry today. He marked it off as a normal maintenance expense. It wasn't really—it was the result of faulty lubrication practices. A Texaco Lubrication survey spotted the trouble—solved the problem. Now the manufacturer operates with a Texaco Organized Lubrication Plan—and the trouble no longer exists.

Chances are the same thing is happening in your plant right now—It doesn't have to.

A Texaco Organized Lubrication Plan can extend parts life significantly—saving thousands of dollars in replacement parts and even more in uninterrupted production for longer periods.

Get full details on Texaco Organized Lubrication from your local Texaco Lubrication Engineer. He can supply you with a copy of "Management Practices that Control Costs via Organized Lubrication." Or write: Texaco Inc., 135 East 42nd Street, New York 17, N. Y., Dept. F-112.

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

American
OPEN-END
Drive-In or *Drive-Thru*
ADJUSTABLE RACKS

have what it takes to cut labor costs and give you more storage space for your dollar!

6 BIG WORDS tell the story of the wide popularity of American "Drive-In" and "Drive-Thru" racks . . . **LOWER LABOR COSTS—MORE STORAGE SPACE.** And here's why American does such a great job in solving mass storage problems . . . American "Drive-Thru" racks are open at both ends for trucks to travel all the way through, assuring fast, efficient, first-in, first-out load handling . . . American "Drive-In" racks can be used against walls for maximum space-saving, or can be spaced away from walls so trucks can enter from either end . . . American trigger-quick, slide-n-lock stringers make adjustability a simple matter. Get the full story about these rugged storage racks that make non-productive aisle space productive storage space. Write for facts today.

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Sturdy, load-carrying stringers are made of rugged square tubing from one end of a row to the other. They raise and lower like a window, on 4" centers, with the American trigger-quick, slide-n-lock method of assembly.

Any fork truck can drive directly into storage area, to load or unload, the American way.

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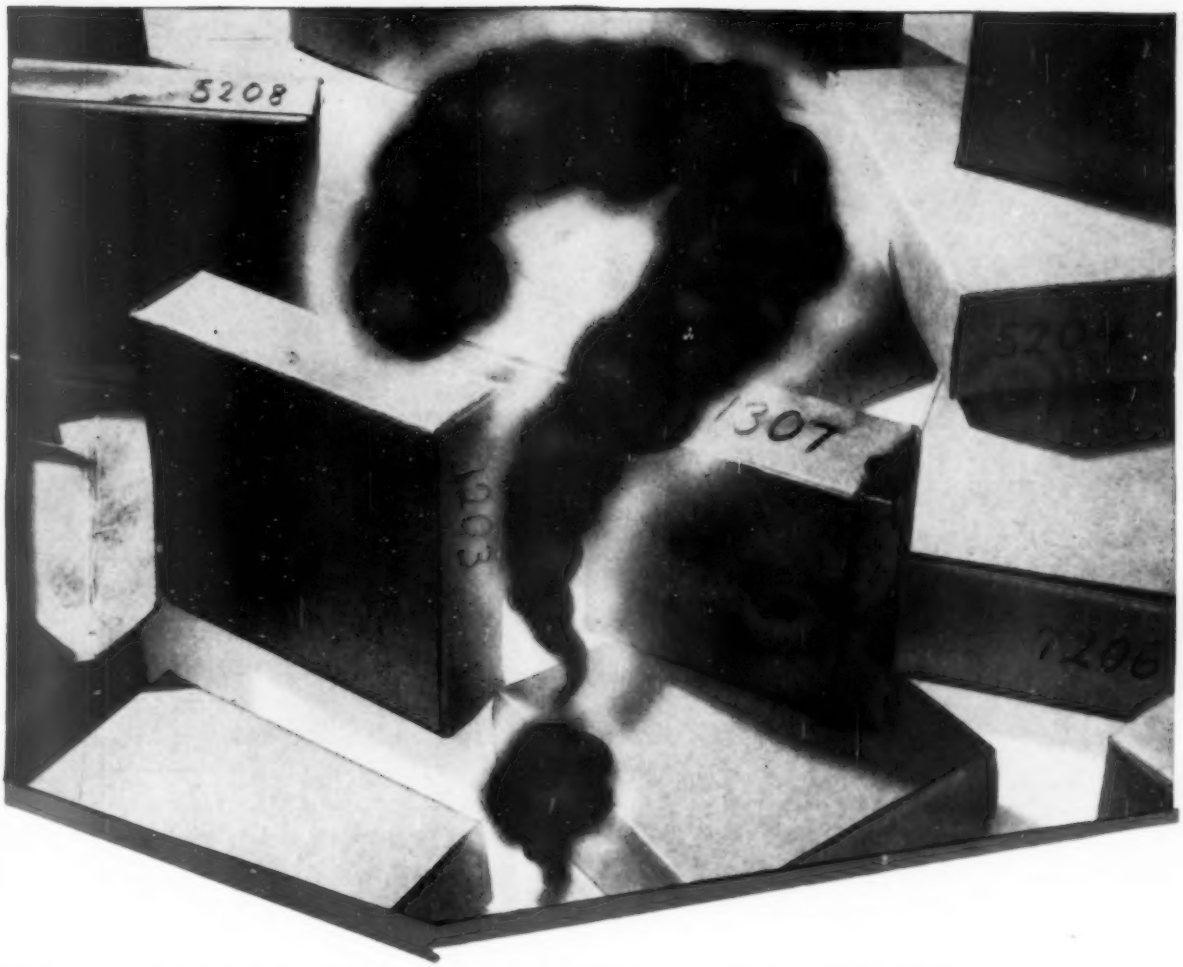

Don't buy a "bearing in a poke" . . . buy from your authorized source, Bearings, Inc.!

Know what you're buying — *Know* that the manufacturer and Bearings, Inc., as an authorized distributor, stand back of every bearing we sell you! *Know* you're getting the latest most improved design with a maximum, useable life.

Know the bearings you buy are in the manufacturers' original boxes, carefully protected from dirt and corrosion. *Know* that your bearings are as specified for precision and fit.

Don't buy a "bearing in a poke" from unauthorized sources — Contact your nearest Bearings, Inc. branch and get the best bearings for your needs. You will save time, trouble and money in the long run!

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OHIO: Akron • Canton • Cincinnati • Cleveland • Columbus • Dayton • Elyria • Hamilton • Lima • Lockland • Mansfield • Toledo • Youngstown • Zanesville
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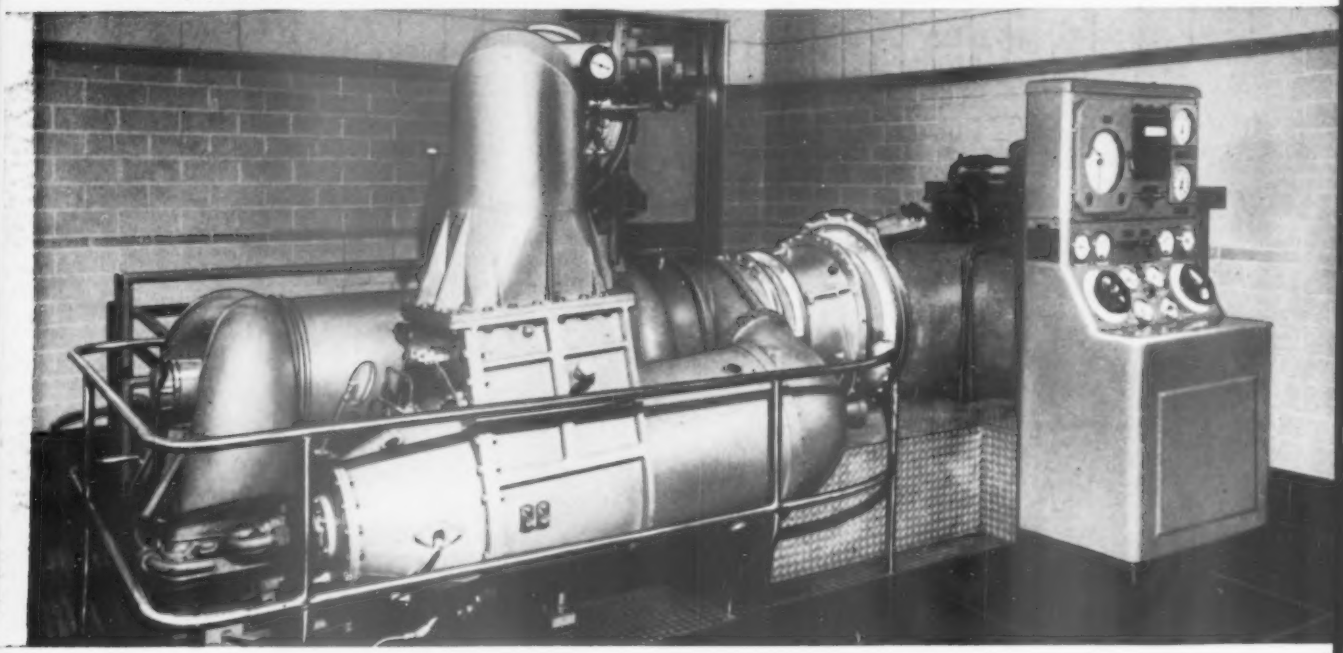
FIRST **IN PRODUCTS PIPELINING** — Up to 100,000 b/d are moved by a centrifugal pump powered by this Clark Mark TA Gas Turbine in a major products pipeline company. The Mark TA and pump do the same amount of work as two three-stage pumps in series driven by 800-hp diesels . . . and require less space, less maintenance.



CLARK MARK TA GAS TURBINES

FIRST FOR FIVE NEW POWER APPLICATIONS

A products pipeline, two widely differing mining operations, a catalytic cracker, a gas/gasoline plant join the trend to gas turbines for power in field and plant applications. And they choose the Clark Mark TA Gas Turbine because this lightweight packaged unit is demonstrating dual advantages and economies. Power generation is a prime function, but as an operating bonus, its hot exhaust gases can generate process steam, hot water and air.

There are sound reasons for the growing popularity of Clark Gas Turbines. An efficient, single combustion chamber—using gaseous or liquid fuel—provides the design simplicity and dependability required for long service life with minimum maintenance. Thermo-elastic design makes it possible to accept full load quickly without stress. Dual-shaft construction assures maximum speed flexibility for process use. Air cooling makes Clark Gas Turbines ideal for locations where short water supply is a problem.

The Clark Mark TA Gas Turbine is conservatively rated at 1220 bhp, with a normal output speed of 6000 rpm. Three other standard speed models are available. For applications requiring more horsepower, Clark 302 and 305 Gas Turbines are rated up to 9300 bhp.

Your nearest Clark representative has full information on all Clark Gas Turbine models. Or simply write for Bulletins 162 and 163-1 to Clark Bros. Co., 6030 Lincoln Ave., Olean, N. Y.

CLARK

CLARK BROS. CO.

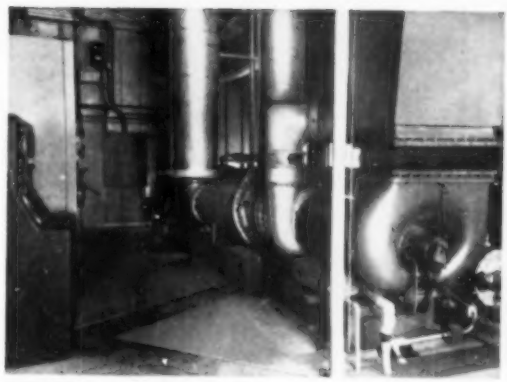
OLEAN, N. Y.

One of the Dresser Industries

COMPRESSORS · ENGINES · GAS TURBINES

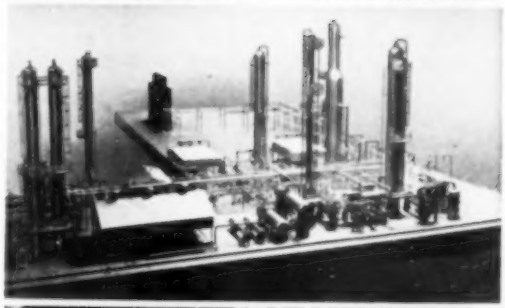
FIRST IN OFFSHORE SULPHUR MINING

Seven miles out in the Gulf of Mexico, Freeport Sulphur Company uses a Clark Mark TA as prime mover in the production of molten sulphur from a deposit 2000 feet below the surface of the Gulf. The Mark TA by driving an electric generator produced power for the drilling rig that put down the production wells (this is the first time a gas turbine has been used on an electric rig). After the main power plant is on stream, the Mark TA will continue in service: (1) Producing part of the plant electrical power used for many vital functions including powering the Clark Balanced/Opposed Compressors supplying the air which lifts the molten sulphur to the surface. (2) Supplying the boilers with hot combustion air which, with supplementary fuel, will generate the steam necessary to heat 5 million gallons of water per day used to melt the sulphur deposit.



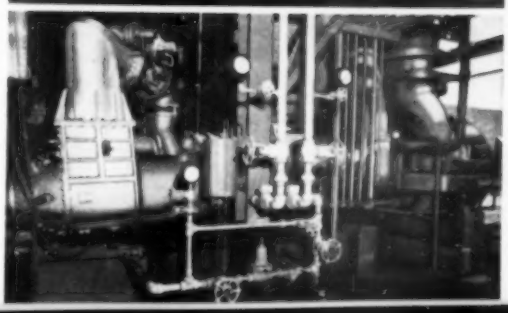
FIRST IN OPEN PIT MINING

This Clark Mark TA driving a generator not only supplies electricity for operation of the Greybull, Wyoming, installation of the Magnet Cove Barium Corporation, but in addition its exhaust gases are used for drying ore. Even discounting the ore-drying bonus, the mine manager reports "better than anticipated fuel economy."



FIRST IN GAS/GASOLINE PLANT

All electric power requirements plus generation of process steam in a waste heat boiler will be accomplished by a Clark Mark TA in the gas processing plant now being constructed for Sun Oil Company near Laverne, Oklahoma (model shown). Initial plant capacity is rated at 100 M.M.s.c.f.d. A projected 50 percent expansion can be accomplished with the same power unit.

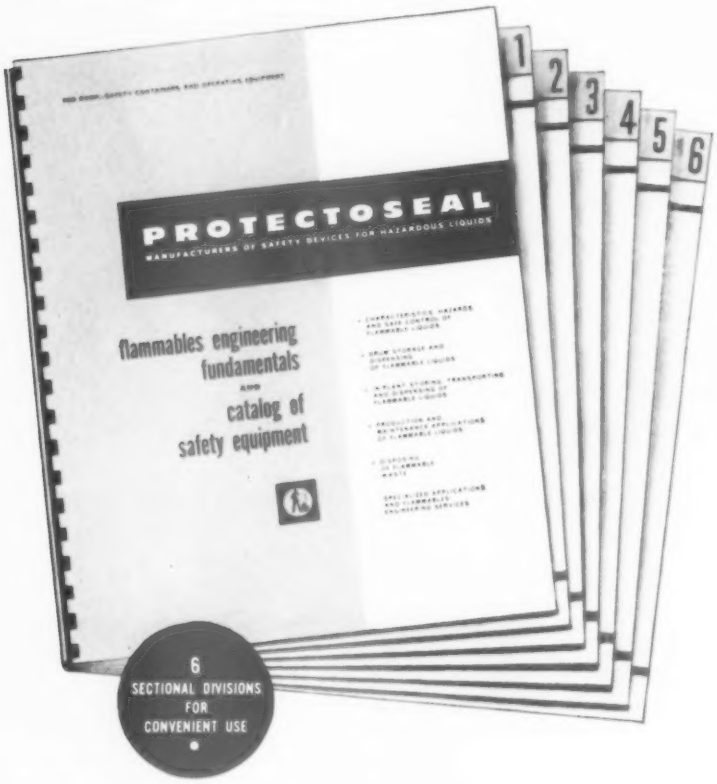


FIRST ON A SMALL CAT CRACKER

This Clark Mark TA, mounted outdoors, drives a cat cracker blower supplying air directly to a catalyst regenerator at the Duncan, Oklahoma, refinery of DX Sunray Oil Company. Though larger gas turbines have been used in this manner before, the Mark TA is demonstrating the efficiency of smaller applications. The Mark TA Gas Turbine is available through a licensing agreement between Ruston-Hornsby Ltd., Lincoln, England, and Clark Bros. Co.

For more facts Circle 465 on Reader Service Card

NEW! Complete Protectoseal Safety Engineering Equipment Catalog and Manual



Just published, a practical working guide to the safe, cost-cutting use of flammable liquids to speed production throughout the plant. It covers in detail the complete handling and application of flammables from receipt on the premises in original containers or drums, through each individual production application or use, to final disposal.

Divided into six sections of production activity, the catalog presents the safety problems involved in employing flammables at each work station; then describes and illustrates the specially designed safety containers and dispensers which provide worker and plant protection, fit naturally and easily into each production process, and actually increase productivity.

Sectional Divisions include: 1. Characteristics, Hazards and Safe Control of Flammable Liquids, 2. Drum Storage and Dispensing, 3. In-plant Storing, Transporting and Dispensing, 4. Production and Maintenance Operations, 5. Disposing of Flammable Waste, 6. Specialized Applications and Flammables Engineering Service.

Each section consists of

Flammables Engineering Fundamentals

Recommendations as to the safe, productive uses of hazardous liquids with guides to selecting the proper equipment.

Safety Equipment Specifications

Complete, detailed descriptions of the capacities, sizes, construction and operating features of all types of flammables safety equipment.

Check coupon to request Manual.

Materials handling costs reduced — flammables stored at-the-job

Cabinet vaults are invaluable time savers since renewal supplies are instantly accessible, safely stored for plant protection, and eliminate time-consuming, costly trips away from productive work to remote central storage vaults.

Many insurance companies and local fire departments endorse this method of storing flammable liquid

solvents and cleaners at the most convenient locations within plant departments. The cabinet vaults conform to the specifications of the National Fire Protection Assn. They have been approved by the Board of Standards and Appeals, City of New York, and the Pennsylvania State Police Bureau of Fire Protection, as well as by the Fire Chiefs of many industrial cities.

For Further Information Circle Item 11 on Coupon

Use empty drums for economical, fire-safe disposal of plant wastes

Don't throw away used 30-gallon or 55-gallon steel drums—use them throughout the plant for receiving waste cloths, rags, trash. Special drum safety covers can be easily attached, which convert these drums into inexpensive, extra-large receptacles for the safe disposal of waste materials. Fusible link mechanisms drop the covers instantly to snuff out fire within the drums. Covers are easily attached by single steel straps and quickly removed for emptying drums, without unfastening the straps.

For Further Information Circle Item 40 on Coupon

BY PROTECTOSEAL

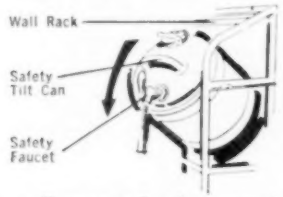
PROCESSING AND IN MAINTENANCE

Published by
THE PROTECTOSEAL COMPANY
CHICAGO 8, ILLINOIS

WEST COAST WAREHOUSE: LOS ANGELES, CALIFORNIA
EAST COAST WAREHOUSE: CAMDEN, NEW JERSEY
IN CANADA: SAFETY SUPPLY CO., TORONTO

Space-saving safety dispensers measure flammables supplies

Single or double space-saving dispensers are being rapidly adopted in wide number of diversified plants for many industrial production line processes. The convenience and accuracy of dispensing measured amounts of liquid from out-of-the-



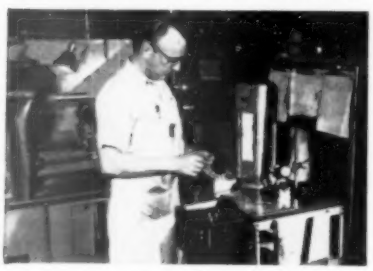
way wall mounted safety cans is desirable; hazardous spillage is avoided and worker time is conserved. The cans remain in an upright position when not in use and avoid the constant pressure of liquid against the safety faucet valve. The built-in faucet is the self-closing type which automatically stops the flow of the liquid when hand pressure is removed. Cans tilt easily for dispensing and swing back to the upright position upon release. Wall brackets may be quickly and easily mounted at any desired plant location.

For Further Information Circle Item 27 on Coupon

"Miking" at the machine for parts accuracy— an aid

At Bell & Howell in Chicago, the introduction of a "quality control" system required each parts-machine operator to make his own inspection of parts accuracy without leaving his station. Cutting oils and chips are now removed from parts in a special work-high solvent container attached to a bench alongside his machine and critical dimensions "miked" for accuracy right at the job. This time-saving inspection keeps machine adjustments accurate and prevents costly build-ups of imperfect parts.

For Further Information Circle Item 36 on Coupon



Speeds screw machine output at Pyle National

Placed conveniently near the screw machines at the Pyle National Company plant in Chicago, Protectoseal *Air-Matic Parts Washers* clean parts after machining to remove chips, cutting oil and grease while the operator continues his work without loss of time.

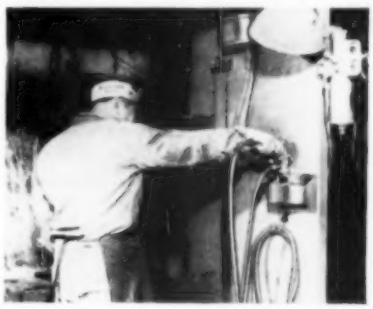
Operated by a simple, effective air motor, a metal parts basket in the tank is moved through the cleaning solvent with a minimum amount of turbulence to reduce solvent evaporation yet provide an effective cleaning motion. A reciprocating compressed air motor is employed, rather than an electric motor, to avoid the possibility of sparks. A fusible link assembly automatically closes the tank cover in the event of fire.

For Further Information Circle Item 20 on Coupon

Prevent spray gun clogging— cut lost production time

The Protectoseal *Self-Cleaning Spray Gun Holder*, in use for more than five months in the finishing department of an automotive manufacturer, has saved, "four hours spray gun cleaning time daily."

The unit is designed to keep only the nozzle-tip of a paint spray gun immersed in solvent when the gun is not in use, to prevent paint from hardening

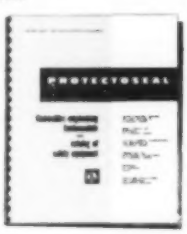


at this point. It is not necessary to remove paint and air hoses. The unit is small, compact, and may be mounted in spray booths at the correct working level.

For Further Information Circle Item 22 on Coupon

DATA OF INTEREST AND VALUE TO PLANT MANAGEMENT

THE FAMILY OF PROTECTOSEAL CONTAINERS FOR STORAGE AND DISPENSING



☐ Send my personal registered copy of the Protectoseal Flammables Safety Engineering Catalog and Manual

☐ Further information on the items circled below:

11 20 22 27 36 40

The Protectoseal Company
1962 South Western Avenue, Chicago 8, Illinois

Name _____ Title _____

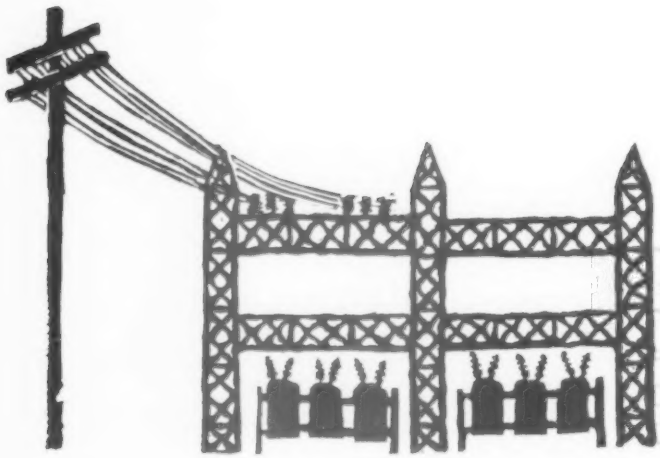
Company Name _____

Address _____ City & State _____

For more facts Circle 466 on Reader Service Card

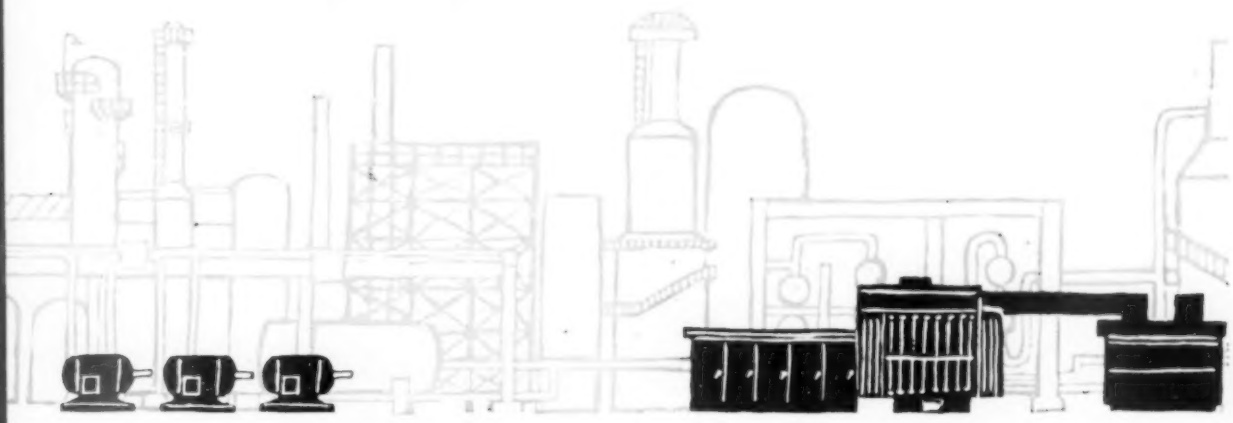
POWER-UP FOR PROFIT

Sinclair Refining modernized



Result: increased production,

ELECTRICALLY



and expanded their Houston refinery

improved products, reduced costs

Greater use of electrical energy and up-to-date electrical equipment can help you get a better return on your investment through improved operations. In your plant, it may be higher capacity machinery, more efficient equipment or engineered controls. Whatever the need, maximum use of low-cost kilowatthours can help you earn satisfactory profits. You will need more capacity to meet the 40% increase in demand for goods by 1965.

Be sure—like Sinclair Refining—that your electrical equipment is engineered to produce earnings as well as output. Call your Westinghouse representative. He can tell you the electrical steps you can take now to start a Power-Up program in your plant. J-96129

YOU CAN BE SURE...IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL DESI ARNAZ SHOWS" CBS TV FRIDAYS

the most important thing to look for in drills is the word SKIL on the nameplate!

Skil is the mark of a drill that will do the job it was bought to do . . . a drill with something extra in the "built-for-keeps" department . . . a drill with beefed-up bearings, gears and switches for fewer breakdowns and next-to-nothing maintenance costs . . . a drill with power to spare when the going gets heavy.

The only question is *which* Skil drill best meets your specific drilling need.

Skil makes as broad a range of models as you'll find . . . from compact, powerful ¼-inchers up to ¾-inch and 1-inch "big jobs." Close to 100 specialized accessories greatly multiply their usefulness.

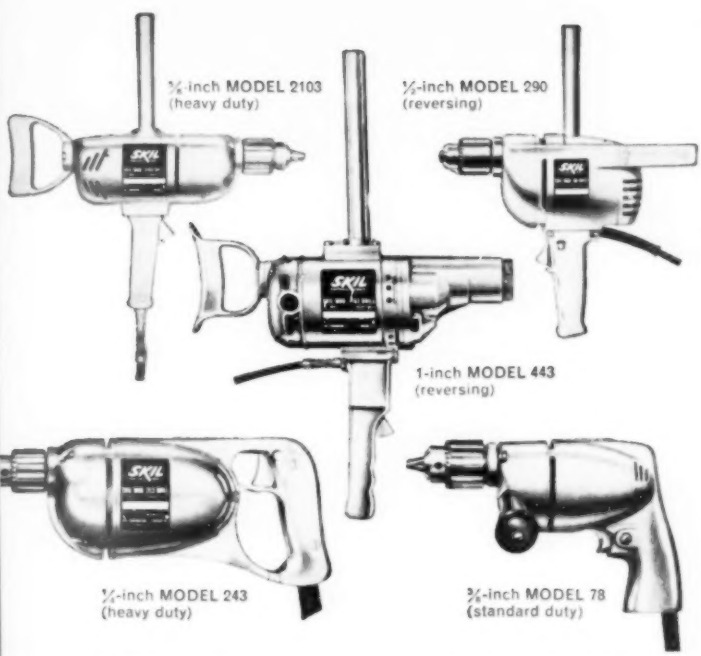
We promise you this: Any one of 21 different SKIL models you choose will change a lot of your ideas about drills. Your SKIL dealer has the facts to convince you. Get in touch with him soon and ask for a free copy of the 58-page SKIL Industrial Power Tool Catalog. It contains detailed information on over 100 different SKIL Industrial Tools. Or simply mail coupon.

P.S: *34 completely equipped factory branches and 50 factory-authorized SKIL service stations are strategically located for quick, reliable service.*

21 DIFFERENT MODELS—HANDLE THE TOUGHEST DRILLING JOBS GOING!

¼-inch MODEL 138 (standard duty)

FACTORY



SKIL

Famous SKIL and SKILSAW products, made only by SKIL Corporation, 5033 Elston Avenue, Chicago 30, Illinois. In Canada: 3601 Dundas Street W., Toronto 9, Ontario.

FREE! 58-PAGE INDUSTRIAL POWER TOOL CATALOG

SKIL Corporation, Dept. F-109
5033 Elston Avenue • Chicago 30, Illinois

In Canada:
3601 Dundas St., West • Toronto 9, Ontario

☐ Please send me name of nearest SKIL Dealer

☐ Please send FREE 58-page Industrial Tool Catalog

Name _____

Company _____

Address _____

City _____ *Zone* _____ *State* _____

For more f s Circle 468 on Reader Service Card

"Will somebody please find Jensen!"

(With **pagemaster**® you'd find him in seconds!)

How often do you waste enormous amounts of time and energy—send your blood pressure soaring—because you can't find key people when you need them?

With a PAGEMASTER *selective radio paging system* by Stromberg-Carlson you can reach the people you want *instantly*. You can measure the value of PAGEMASTER in terms of time, sales—even lives.

Here's how it works. Jensen is equipped with a transistorized pocket-size radio receiver. When you want to contact him, you call him by phone. If he's away from his usual location, your switchboard operator sets his *private code signal* on the encoder (a compact unit located next to the switchboard) and flips a switch.

Instantly his receiver—and no other—responds with a pleasant, but commanding signal. He knows he's wanted, picks up the nearest phone and reports. The page automatically repeats every 20 seconds. As many "Jensens" can be equipped with receivers as you want.

You can have a PAGEMASTER system engineered to your own requirements, whether yours is a single- or multi-building operation. Systems are available for lease or purchase. As your needs grow, you can add receivers without additional installation cost.

For details, write to us at 203 Carlson Road. Your inquiry will bring a prompt and complete response.

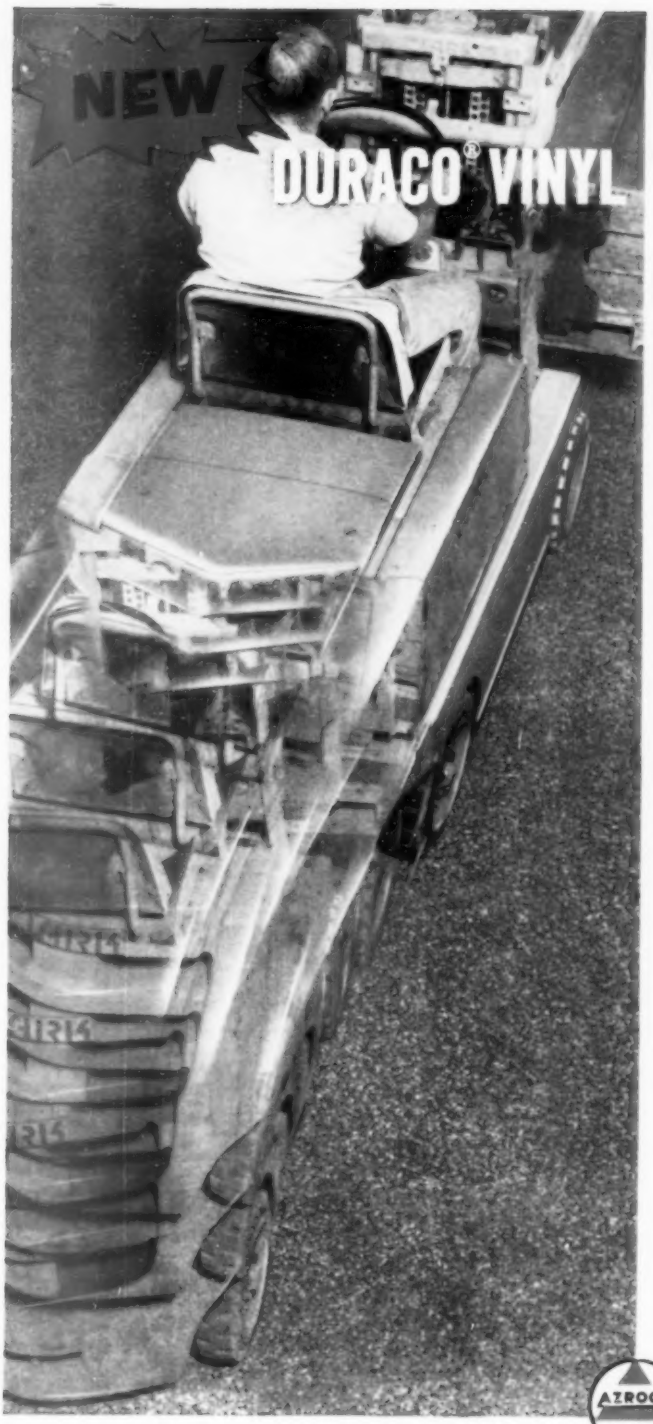
"There is nothing finer than a Stromberg-Carlson"

STROMBERG-CARLSON

A DIVISION OF **GENERAL DYNAMICS CORPORATION**

ROCHESTER 3, NEW YORK

For more facts Circle 469 on Reader Service Card



INDUSTRIAL TILE

Built to take TRUCKING

Does your floor have the "backbone" to withstand the grinding abrasive abuse of in-plant trucking? Duraco is built to take the punishment of rolling friction and impact – with an all-vinyl binder that won't crack, break up or disintegrate under the toughest traffic.

This remarkable industrial flooring is built to do a better job in plant and factory areas. It's greaseproof and acid-resistant – easier and safer to walk and work on – much easier and quicker to clean. It's the answer to lower floor costs per square foot per year in your plant. Let Duraco prove itself in your plant without obligation to you. Our representative will be glad to discuss the details of the Duraco Test Area Program with you.

SPECIFICATIONS

Available in 5 terrazzo colors, 5 marbleized colors – coordinated with accepted industrial color standards. Size 9" x 9". Thicknesses: Standard Gauge 3/32" – Heavy Gauge ⅛".

AZROCK FLOOR PRODUCTS DIVISION
UVALDE ROCK ASPHALT CO.
605 FROST BANK BLDG. • SAN ANTONIO, TEXAS

AZROCK FLOOR PRODUCTS DIVISION
505 Frost Bank Bldg. San Antonio, Texas

We are interested in Duraco. Please have your representative call to discuss the Test Area Program with us.

NAME_____

FIRM_____

ADDRESS_____

CITY_____ STATE_____

For more facts Circle 470 on Reader Service Card

How many thousands of dollars do these

High purchase price or rental fee—

$_____

Inadequate inventory control—

$_____

Production time lost by employees seeking fresh wipers—

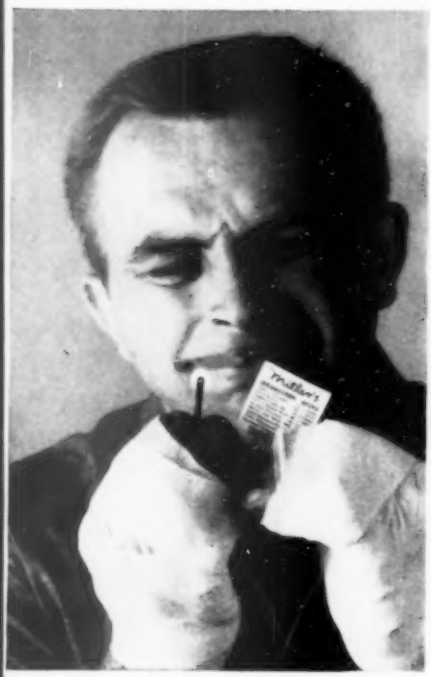
$_____

You can save money on industrial wiping—if you know where it's being lost. To help you find out, Scott has prepared a Wiping Cost Survey which enables you to pinpoint your direct and indirect costs. A 24-page booklet suggests ways to reduce your wiper expense. User reports tell how many firms—Westinghouse, Sinclair, Ekco-Alcoa, BCA, Curtiss-Wright, to name a few—attacked their wiping problems and brought them under control. Any or all of this information is yours, free, on request. Ask your Scott paper merchant, listed in Yellow Pages under "Paper Towels." Or mail the coupon.

SCOTT PAPER

For more facts Circle 471 on Reader Service Card

wiping problems cost you annually?



Dermatitis caused by unsanitary wipers—

$_____

Crib time lost in counting, sorting, recording new and used wipers—

$_____

Rejects caused by lint, scratches, inefficient wiping performance—

$_____

SEE HOW YOU CAN CUT WIPER COSTS IN YOUR PLANT—MAIL COUPON TODAY

☐

Send the 24-page illustrated booklet, "Industrial Wiping—an area where costs can be cut!" (Describes the modern methods of determining wiping costs and controlling them through value analysis and programming.)

☐

Send User Reports of cost-cutting wiper programs in the following industries:

- ☐ Aviation
- ☐ Chemical
- ☐ Electrical
- ☐ Food
- ☐ Machinery
- ☐ Metals
- ☐ Petroleum
- ☐ Transportation

☐

Send the Scott Wiping Cost Survey—a simple form that analyzes the exact cost of my present wiping program.

SCOTT PAPER COMPANY
Department F-910, Front and Market Streets, Chester, Pennsylvania

Please send me—without cost or obligation—the wiper information checked above.

Name_____

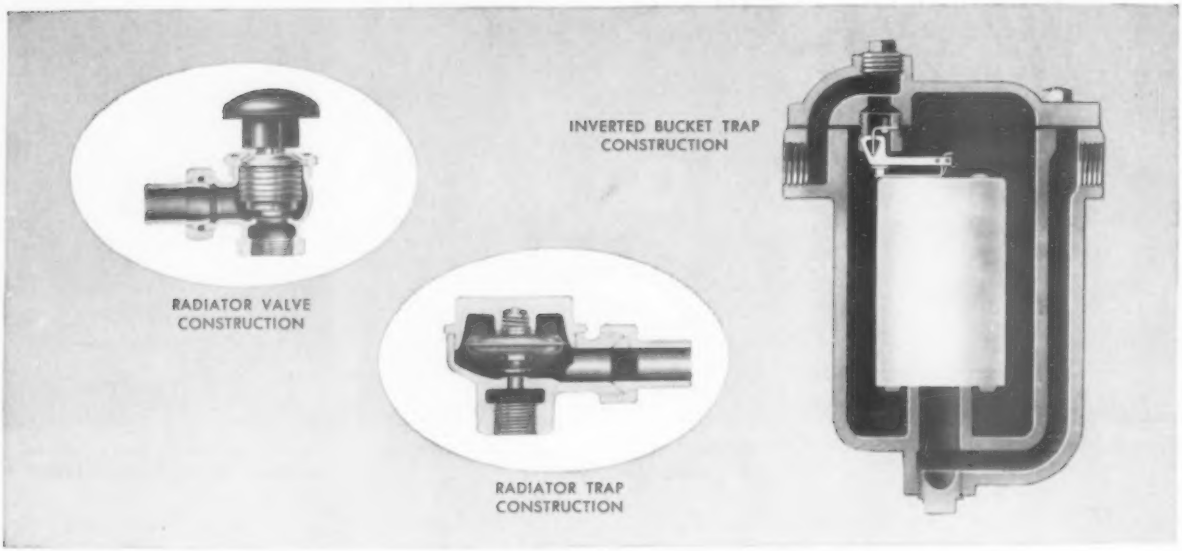
Title_____

Company_____

Street_____

City_____ Zone_____ State_____

25″ Vacuum to 150 lbs. Pressure...
You'll Find it in DUNHAM-BUSH
Steam Heating Specialties



It's a hefty jump from 25″ vacuum to 150 lbs. pressure. But it gives you an idea of the complete scope of quality Dunham-Bush Steam Heating Specialties.

Name a steam heating specialty and Dunham-Bush has it!

You know steam heating specialties, but do you know the advantages of dealing with "one source—one responsibility"... Dunham-Bush?

If not, it'll pay you to write for free brochure #1501 and/or the name of your nearest Dunham-Bush sales engineer.

PART OF THE DUNHAM-BUSH LINE . . .

F & T TRAP | RADIATOR TRAP | THERMOSTATIC TRAP | BUCKET TRAP | STRAINERS | AIR ELIMINATOR AND AIR CHECK GAUGES

Dunham-Bush, Inc.

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DUNHAM-BUSH

AIR CONDITIONING • REFRIGERATION • HEATING • HEAT TRANSFER

WEST HARTFORD, CONNECTICUT • MICHIGAN CITY, INDIANA
MARSHALLTOWN, IOWA • RIVERSIDE, CALIFORNIA
SUBSIDIARIES

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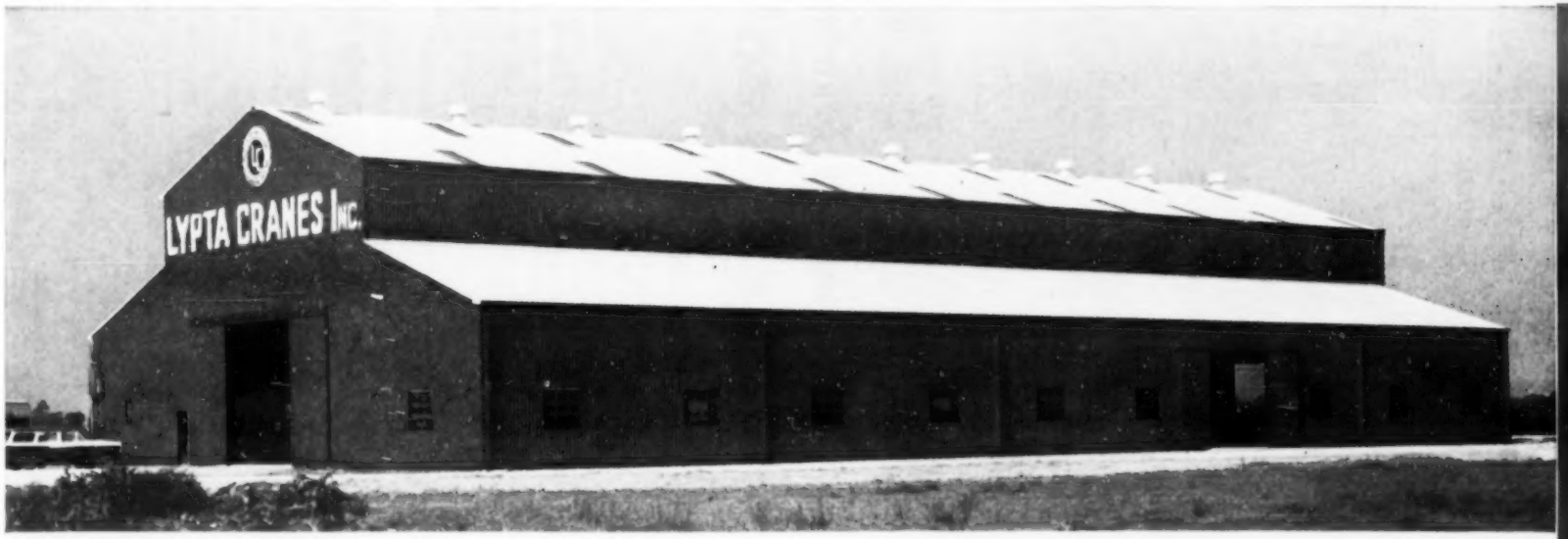


New 25,000-square-foot plant, produced by Stran-Steel's Metallic Division in Houston, provides greater efficiency for Lypta Cranes Incorporated.

STRAN-STEEL BUILDINGS—NOW IN COLORS!

at Houston, Texas

ANOTHER COLORFUL STRAN-STEEL BUILDING

mass-produced for low cost; custom-constructed to exact needs!

Another satisfied Stran-Steel customer—Lypta Cranes Inc., of Houston, Texas. There's an attractive Stran-Steel building designed to meet your requirements, too. Stran-Steel building components are precision-engineered and mass-produced; complete flexibility permits custom-construction on your site. Result: surprisingly low cost per square foot! That's the beauty of owning a Stran-Steel building; you get an extraordinary combination of low cost *and* custom design.

Choose from six factory-applied Stran-Satin colors (blue, bronze, gray, green, rose or white) that won't chip, fade, peel or crack. Handsome themselves, Stran-Satin colors blend beautifully with brick, stone, wood or glass. Fact is, your new Stran-Steel building will look newer longer and require a minimum of upkeep with protective Stran-Satin colors.

How much will a Stran-Steel building cost? Usually *less* than rent payments for similar space! Our five-year purchase plan, requiring only 25% down, can be handled by your Stran-Steel dealer. And, if you wish, he'll take care of planning and construction. For full information, mail coupon or call your Stran-Steel dealer listed in the Yellow Pages under *Steel Buildings* or *Buildings—Steel*.

Stran-Steel

DEALERS EVERYWHERE

Dept. FMM-45

STRAN-STEEL CORPORATION

Detroit 29, Michigan • Division of

NATIONAL STEEL CORPORATION

Stran-Steel Corporation, Dept. FMM-45
Detroit 29, Michigan

Please send data on Stran-Satin Color and complete literature on industrial buildings. I'm interested in a building approximately _____ ft. x _____ ft. to be used mainly for _____

Name _____ Title _____

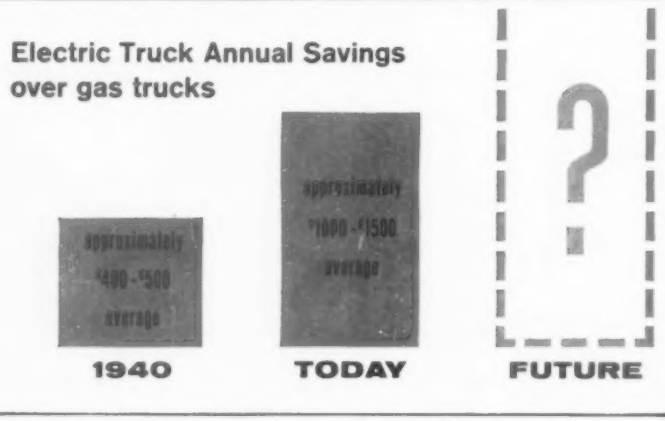
Company _____ Phone _____

Address _____ County _____

City _____ Zone _____ State _____

YOUR ELECTRIC TRUCK BATTERY

Exide Industrial Division, The Electric Storage Battery Company, Philadelphia 20, Pa.



Why miss out on these economies? See how electric truck savings have grown since 1940. You could be saving money right now. And if this trend continues, you can save more every year in the future.

EASE THE PROFIT SQUEEZE

Electric Truck Economy Over Gas Keeps Growing and Growing

Even way back in 1940, Exide-battery-powered industrial trucks were roughly 30% more economical than gas-powered trucks. Today they're roughly twice as economical. And the trend suggests still greater economy in the future.

Inflation has driven the cost of most things up sharply. But in the field of materials handling, it has actually favored electric industrial trucks. Examine the three main ingredients of industrial truck cost: fuel, maintenance and depreciation.

The ingredients of truck cost

The cost of gasoline has gone up about 80% since 1940. But the cost of battery power is still at about the same level. This is partly because the cost of electricity itself has actually decreased. And new batteries and chargers give you more capacity and life per dollar of cost.

Maintenance labor rates and parts prices have gone up for both types of trucks. But electric trucks need less than half the maintenance that gas trucks do. Depreciation has always been lower for electric trucks and still is. This is the result of longer useful truck life—estimated to be from 2 to 3 times as great as that of gas trucks.

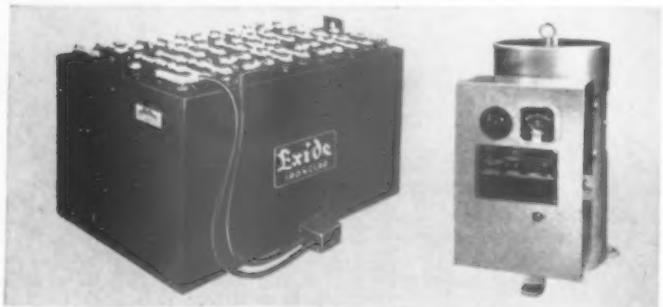
New batteries mean improved performance

Today's electric industrial trucks not only offer greater relative economy than ever before, but also the highest performance ever. The combination of advantages makes them today's best materials handling bargain. Two years ago Exide introduced new improved truck batteries that pack more power into the same space and offer longer life of service. This means that every truck can carry more power capacity for longer work shifts, longer runs, and higher productivity.

Typical savings

Records of thousands of trucks in a wide variety of typical applications indicate that average economies for electric trucks total up to $1500 per truck per year as compared with gas-powered trucks. Why don't you help your company "ease the profit squeeze" by putting electric trucks to work saving you money right now. Exide's plan for leasing batteries and chargers makes it possible to switch with a nominal capital investment.

For data that will assist you in analyzing your own operating costs, write for free copy of 14-page Form 6262



New batteries . . . new chargers. Get the complete Exide power package. 50 years of constant improvement have gone into today's Exide-Ironclad Battery. New materials and advanced construction give it more power and longer life potential than ever. New vertical chargers save ⅔ floor area mounting space. Maintenance is easier and less costly. Get both battery and charger from Exide. Save both ways.

For details on the new Exide-Ironclad Batteries, write for a copy of 8-page illustrated Brochure 6230

Exide®

For more facts Circle 474 on Reader Service Card

For more facts Circle 475 on Reader Service Card ➤

CALL THE TRUSCON MAN...

Be Sure You Have The Best "Paint Protection"

The way to paint-protect your plant, inside and out, at the lowest cost is to use the paint that stays on *longest*. You get maximum economy and maximum protection. Fact.

The paint that stays on longest is the paint that's formulated for specific surfaces under conditions that exist in your plant. There is no one type of paint that is good for all surfaces. Apply one type of paint on all surfaces and you get short-term protection at high cost. False economy.

Call the Truscon man. He'll survey your entire plant — interior and exterior — and give you a detailed report in writing. It will show you whether you have proper protection or whether you're in danger. Absolutely no obligation on your part.

Truscon has been solving industry's paint-protection problems for 50 years. All over the world. Names of well-protected Truscon customers will be sent you on request.

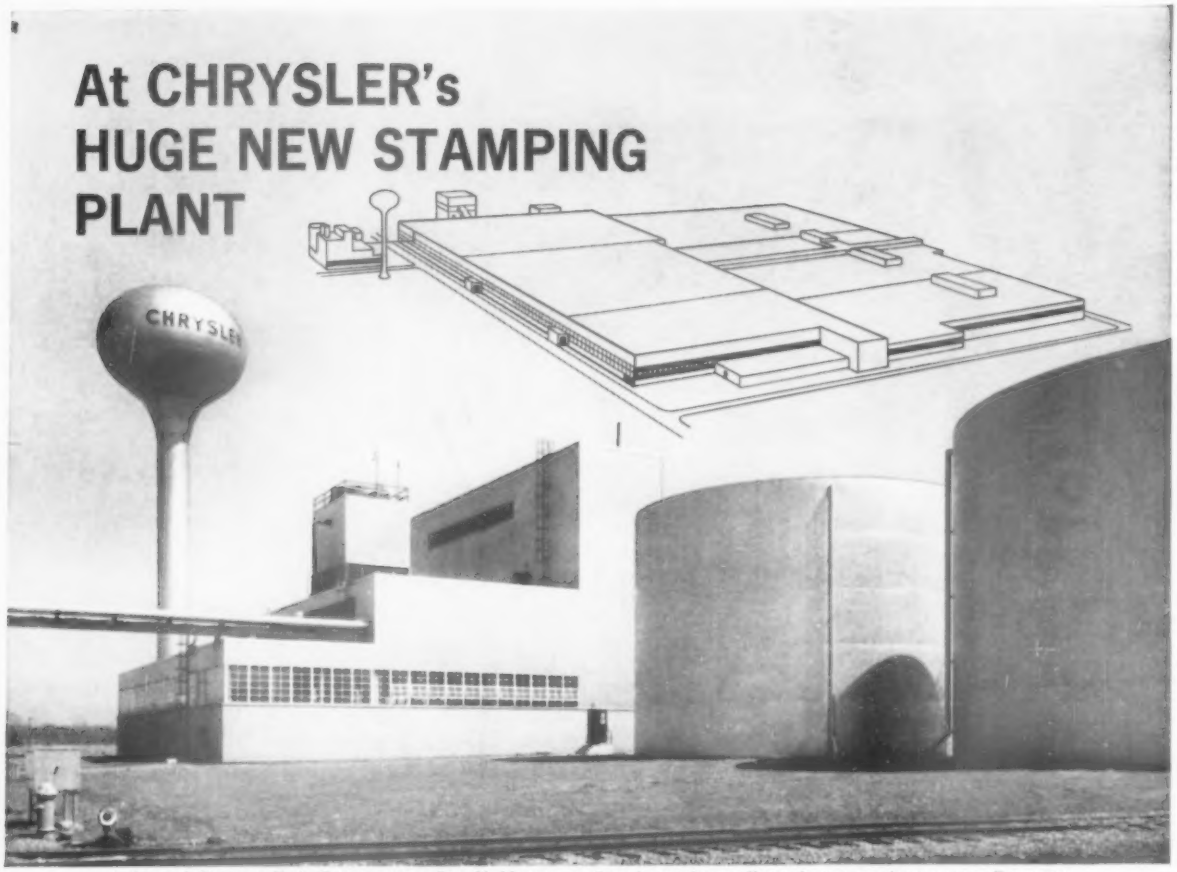
Whatever the surface, whatever the conditions, Truscon formulates protective coatings that insure longer plant life for you. See the Yellow Pages of your telephone directory for the Truscon factory branch nearest you. Or write Truscon Laboratories, 1700 Caniff Street, Detroit 11, Michigan.

Protected with TRUSCON

the "cheapest" way to paint is to use the best paint ...it stays on longer

TRUSCON *Laboratories*

Industrial Maintenance Division of Devoe & Raynolds Co., Inc.
Detroit 11, Michigan



Architect & Engineer: F. A. Fairbrother & Geo. H. Miehls • *Consultants:* Albert Kahn Associated Architects & Engineers
Mechanical Contractor: The Stanley Carter Co.

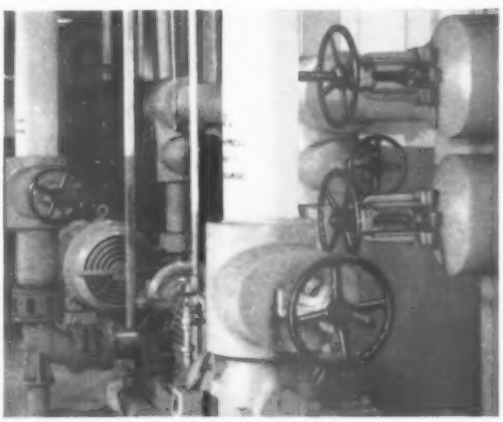
JENKINS VALVES assure reliable, economical control of Production's Lifelines

Cited as one of the nation's "Top Ten Plants of the Year", Chrysler Corporation's stamping plant at Twinsburg, Ohio, is a 34-acre model of building and manufacturing efficiency.

Go into the power plant and you will find Jenkins Valves everywhere, controlling "production's lifelines" that supply 150,000 pounds of steam per hour . . . 30 million cubic feet of air per day . . . 7500 gallons of cooling water per minute. Jenkins Valves got the job because "every effort was made to install the finest mechanical and electrical equipment . . . and to insure minimum costs by eliminating excessive upkeep and equipment with a short life span".

It is a highly significant fact that all building experts and operating engineers agree *"there's nothing better than Jenkins Valves"*. Many will always insist on JENKINS for critical services, and will prefer them for general use. After all, Jenkins Valves cost no more!

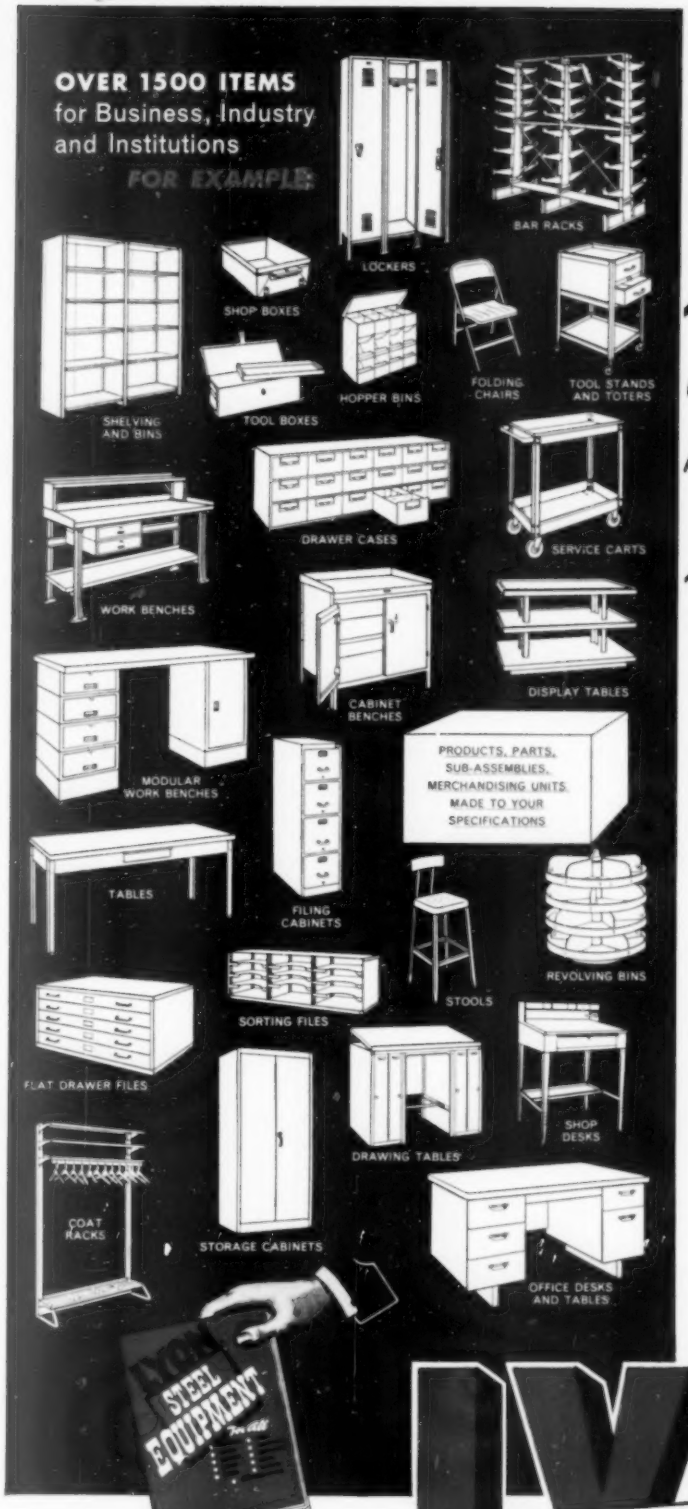
When you are buying or specifying valves, remember that the best valves are the best assurance of economical service. Jenkins Bros., 100 Park Ave., New York 17.



In the ultra-modern boiler house shown above, all general service valves controlling pipelines are JENKINS

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
JENKINS SINCE 1864 Jenkins Bros

Sold Through Leading Distributors Everywhere



THIS CATALOG ILLUSTRATES
THE WORLD'S MOST
DIVERSIFIED LINE
OF STEEL EQUIPMENT
IT'S FREE!

★ QUALITY PROTECTED BY LYON "POINT-CHECK" SYSTEM

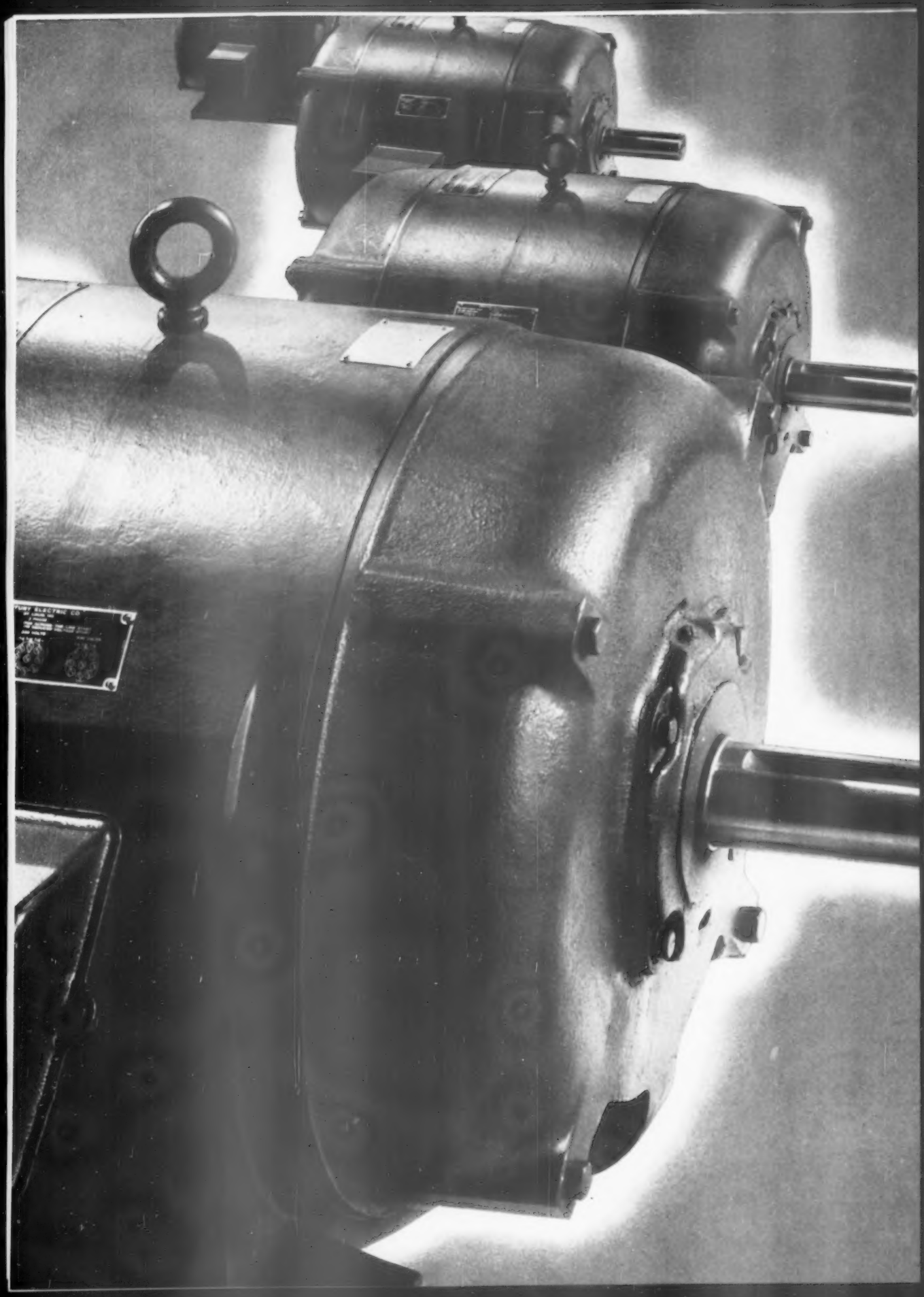
✓ FABRICATING | ✓ ASSEMBLING
✓ FINISHING | ✓ PACKAGING

Look for the "QP" on every Lyon Carton. It is your assurance of quality equipment.

See your Lyon Dealer for prompt delivery of the world's most diversified line of steel equipment

LYON METAL PRODUCTS, INC.
General Offices: 1012 Monroe Ave., Aurora, Illinois
Factories in Aurora, Illinois and York, Pa.
Dealers and Branches in all Principal Cities

LYON®
STEEL EQUIPMENT



Planning your electric motor needs

Experts predict a 75% rise in need for motors to drive air-moving equipment . . . other needs grow faster. Makes correct motor application more vital than ever before.

Take this one small segment of motor driven equipment—fans and blowers. Today the total installed horsepower is 15,000,000 . . . even the most conservative forecasters say that in 1965 it will be 26,000,000—a 75% increase. Horsepower requirements for allied equipment, such as compressors, blowers, unit heaters, air conditioners, refrigeration systems, and pumps, could rise even faster.

On typical new machine tools, motor horsepower has doubled since 1949. Means motors must be more efficient and reliable than ever before. When a production line shutdown can cost hundreds of dollars a minute, anything short of absolute reliability is a luxury most companies can't afford.

There are two things you can do about it: Get reliable motors. Get the right motor on each piece of equipment. Here's how Century Electric can help.

Application know-how—Century Electric makes motors and nothing but motors. Means that Century Electric application engineers know motor drive problems inside and out. They are vitally interested in your motor problems . . . vitally interested in helping you get the right answer.

10,000 choices—Century Electric engineers don't have to rely on only a few types to do all jobs because Century makes over 10,000 types . . . from fractionals up to 400 hp. There is a right one for all equipment and operating conditions.

Reliable operation—Century Electric motors are built to take rugged use with a minimum of maintenance. Here are a few of the features that contribute to reliability and long life:

Tough insulation used in windings has great dielectric and mechanical strength, can resist severe heat shocks as well as resist dirt, dust and acids . . . rotors are precisely balanced to increase life and provide smooth, quiet operation . . . cast iron and steel frames can withstand tough abuse . . . extra coats of insulation dipped and baked on add years to the life of Century motors.

For more information please contact your nearest Century Electric Sales Office or Authorized Distributor. For details on Century's complete line of motors write for bulletin 270A, Century Electric Motor Application Guide. For *more* than just a motor . . .

From over 10,000 types of motors, application engineers can help you get the one that's best for your equipment.

Constant re-evaluation of even the most standard motor helps upgrade quality and improve performance.

Every motor is backed by a network of over 500 motor repair shops . . . your assurance of Century's continuing interest.

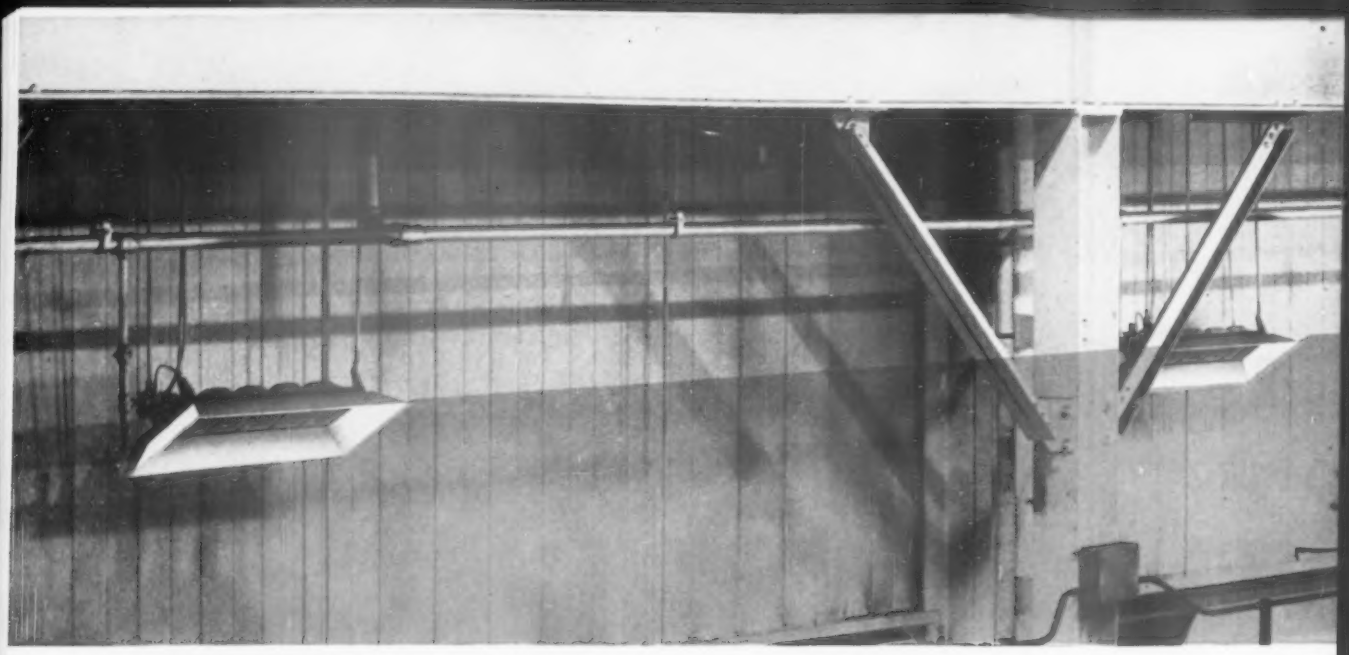
CENTURY ELECTRIC COMPANY

St. Louis 3, Missouri *Offices and Stock Points in Principal Cities*

Century

59-18

For more facts Circle 478 on Reader Service Card



with *Perfection Schwank* INFRA-RED Gas Heaters

"We never give heating equipment

. . . "and why should we," says L. W. Morgan, Plant Engineer at The Yoder Company's new metal-forming machinery plant in Cleveland, Ohio. "We have no blowers, ducts or heat exchangers to worry about. What's more, our employees have never before enjoyed such perfect working comfort . . . even when outside temperatures drop below zero."

"There are no disturbing drafts and we've eliminated the 4 or 5 hour warm-up period required by other systems to bring plant temperatures up to comfort level. Also, machinery and tools are always warm to the touch. We plan to use these same heaters in our next plant expansion."

Comments such as this sum up the feelings of over 15,000 enthusiastic users of Perfection Schwank Infra-Red Gas Heaters. *Call, Write or Wire for complete information and literature.*

MATCH THESE FACTS WITH *ANY* OTHER HEATING SYSTEM!

Building Size: 100′ x 380′ x 40′, plus 30′ x 60′ x 18′ truck dock, plus 40′ x 40′ x 18′ compressor room. A total of 1,581,000 cu. ft.

Construction: Walls: Stainless steel sandwich 1½″ insulation. Roof: 4″ pre-cast concrete, ¾″ rigid insulation.

Heater Mounting Heights: 99 units installed at 16′—18′—40′.

Temperature: 68° constant

Degree Days (63° Base): 5455

Estimated Heat Loss (computed on ASHRAE basis): 3,740,000 BTU per hour

Installed BTU*: 4,488,000

Period of Study: September 16, 1958 to May 10, 1959

Fuel Consumption (Infra-Red): 5,477 Mcu.ft. of natural gas (1000 BTU/cu.ft.) for a total of $3,722 for the period studied.

Electrical Cost: (estimated for Infra-Red): $15.00

Probable Fuel Consumption (ASHRAE—efficiency of 80%): 8,440 Mcu.ft. of natural gas (1000 BTU/cu.ft.)

**Input equivalent to that required with an 80% efficient heating system. Note actual efficiencies.*

Perfection industries 1135 Ivanhoe Rd., Cleveland 10, Ohio

division of Hupp Corporation / licensee of American Infra-Red Radiant Co.

Under Schwank U.S. Patents 2,775,294 and 2,870,830 and pending applications

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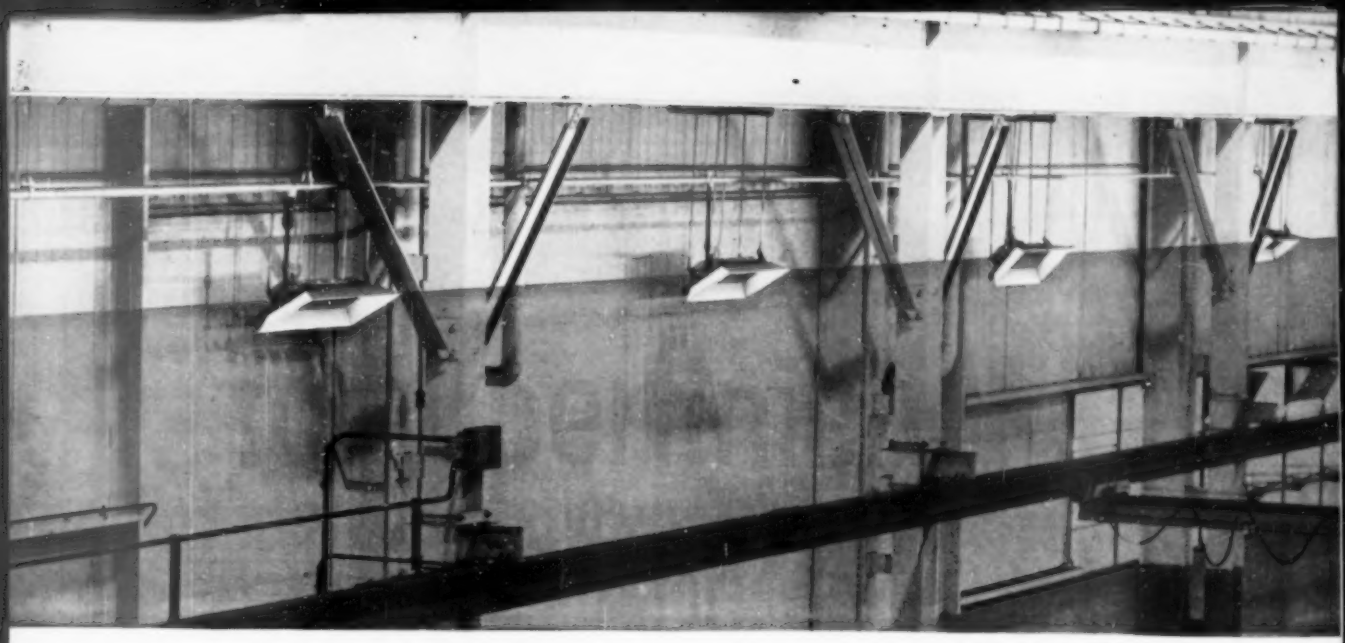
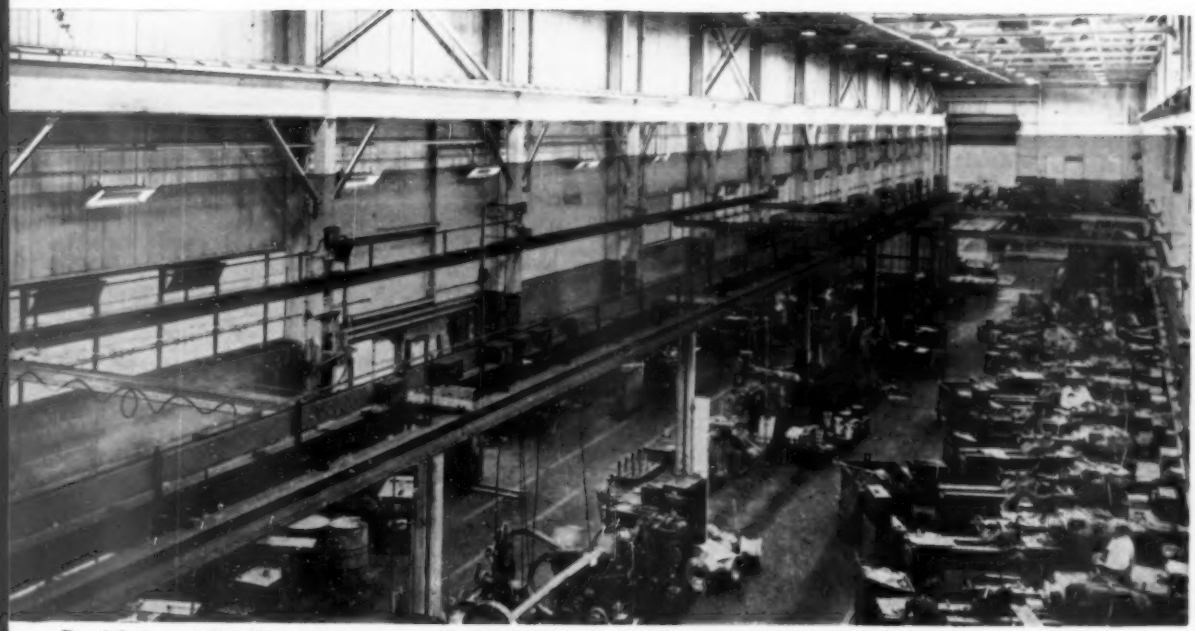
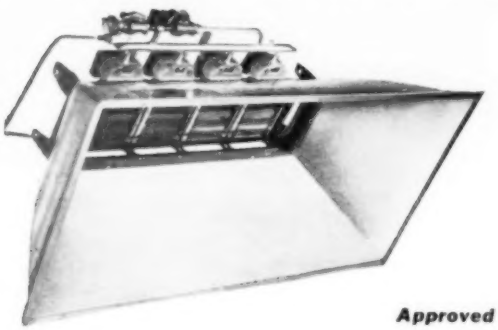


maintenance a second thought"



Partial view of The Yoder Company's new plant, designed by McGeorge-Hargett & Associates, Cleveland, Ohio.



WARM THE MAN AND THE JOB ...*NOT* THE AIR

The rays of heat energy from these generators, like the rays of the sun, heat only the objects they touch and are not wasted on the air around the objects. Once the energy waves strike a person in their path, or the floor, wall or machinery, they are transformed into heat. The result is uniform heating comfort no matter how fast temperatures change.

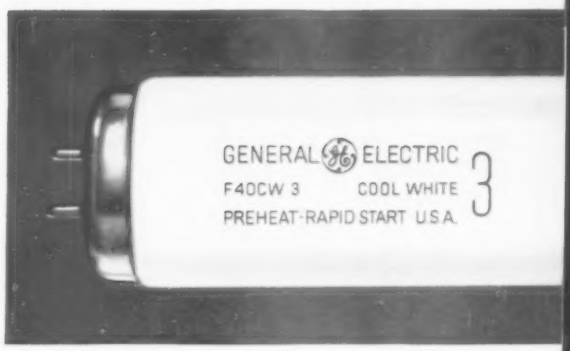
Approved by American Gas Association, Underwriters, C.G.A and C.S.A.

PERFOR

Number 1 reason why your best bargains

IN FLUORESCENT LAMPS, buying on price alone is no bargain at all. (Because the price of the lamps averages only 10% of your operating costs of light.) The other 90% goes for electricity and maintenance. Conclusion? The *best* lamp bargain works your lighting dollar the hardest, gives you the most *light* for your money.

How do G-E Fluorescents stack up? Take the popular 4-foot, 40-watt. The new General Electric PREMIUM 3 Lamp, announced in 1959, delivers more light per watt than any previous 4-foot fluorescents. As for maintenance—out of every 1,000 G-E 40-watt fluorescents you buy today, on the average 999 have no defect which can keep them from working—and 990 will still be burning late in 1961! Practically maintenance-free performance like this makes G-E 40-watt, slimline, high output and the exclusive Power Groove Lamps your best bargains in fluorescent light.



IN MERCURY LAMPS, you have the source which can give you the lowest cost of light of any type of lamp commercially available. Lower than filament—often lower, even, than fluorescent. *And General Electric Mercury Lamps, at any given time in their life, will outperform any other brand the same age* . . . and are built to last as long or longer!

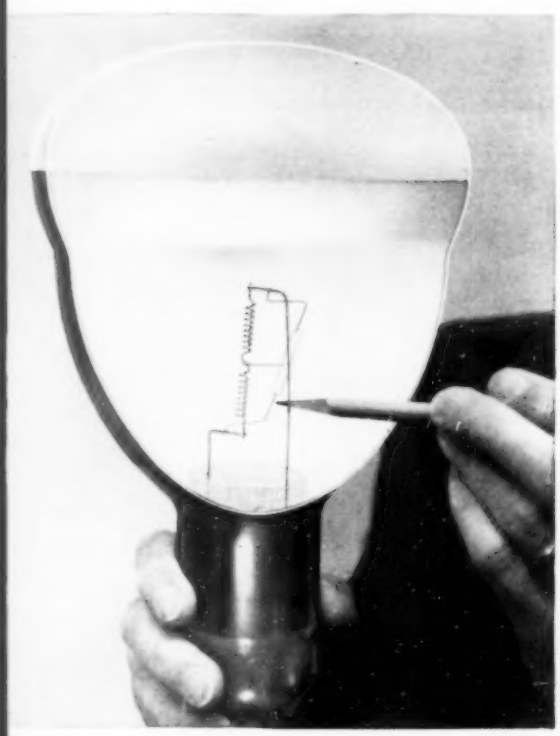
How? To name a few—General Electrics' dramatic new Bonus Line electrodes, better arc-tube design, and fewer parts to intercept light. And a new 1959 line of six G-E Bonus Line 400-watt Mercury Lamps are your *biggest* bargain in mercury light.

IN FILAMENT LAMPS there are some important differences between brands—some of which are detectable even *before* you put the lamp in a socket. Like the new 1959 smaller, brighter, 100-watt lamp bulb that's small as a 60-watter but delivers more initial light than two 60's. Or the new 1959 G-E Quartzline lamps that are pencil-thin but pack up to 1500 watts.

Or like the new 1959 RB-52 Bonus Line 1000-watt reflector lamp shown at right. Special bulge shape distributes heat, so a less-costly, regular glass is used—with savings passed on to you. And look! It uses General Electric's stand-up filament that delivers more light than ordinary "draped" type, has more expensive *silver* reflector instead of aluminum. It gives you 20-30% extra light on the work plane. Big things are happening in G-E Filament lamps—all pointing to a bigger bargain in filament light for you.

MANCE

in light are General Electric Lamps



IF YOU'RE BUYING REPLACEMENT LAMPS or installing new lighting . . . it's easy to pick the General Electric Lamp that'll give you the *best bargain in light* . . . whether you use filament, fluorescent or mercury. Your best bet is to see your General Electric Large Lamp supplier. He'll help you pick the lamp type, size and "color" best for your particular application. Remember, General Electric Lamps are tops in performance—the best combination of light output, lamp life, reliability and color.

FREE FROM G. E. Right now... today you can get a startling new 20-page picture paper packed with factual information on lamps and lighting that can save you big money. Write for your free copy today. Just send your name, company, address, to General Electric Co., Large Lamp Dept. C-931, Nela Park, Cleveland 12, Ohio. Be sure to ask for "FACTS OF LIGHT".

Progress Is Our Most Important Product

GENERAL ELECTRIC

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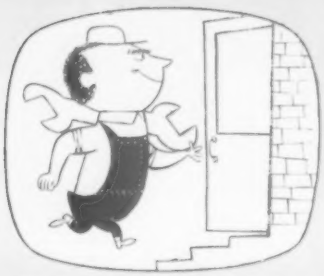
4-Way® Safety Plate Presents

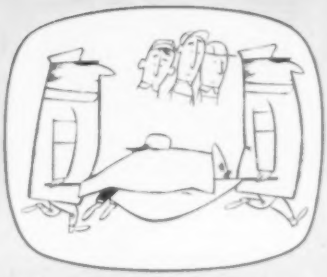
A GRIPPING TALE OF LIFE ON SKID ROW

THE BIG SLIP!



Enter our star—Benny Bandsaw. Great guy on the production line. Mr. America to his wife and kids. Every day Benny and millions just like him, go to work on Skid Row.

Watch it, Benny—look out! Wow! Too bad. On Skid Row, what *on the surface* appears to be a safe place to work, may turn out to be a surprise for Benny and his buddies.



And thus, another Skid Row tragedy. Our hero gets the slip and the result is *lost* time...*lost* production...*lost* safety records . . . and *lost* money.

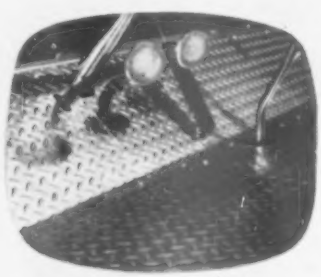
But...help is at hand. Enter 4-Way salesman...J. W. Goodheart...genial representative for versatile, slip-resistant 4-WAY Safety Plate!

Solution? Yes, Sir! Industrial plants, stores, offices, schools, hospitals, all over the USA, use 4-WAY . . . find it SAFE, STRONG, EASY TO CLEAN, ATTRACTIVE!

What's more, 4-WAY can be flame cut, sheared, sawed, drilled, punched, welded, formed . . . it is simple and EASY TO FABRICATE!

FIRESAFE, too! 4-WAY is an added safeguard for your people, your plant, your equipment and stock . . . and my how those insurance men appreciate it.

When it comes to installation and maintenance, no special tools or skill is required. Inland 4-WAY Safety Plate is one of the most ECONOMICAL materials you can use!



And don't overlook the advantages of super-strong, mighty-attractive, 4-WAY on the products you make. It can add an important merchandising feature that will help boost sales.

AMERICAN STEEL WAREHOUSE ASS'N

INLAND

4-WAY® SAFETY PLATE

Available at your Steel Service Center or from Inland in a wide variety of patterns and sizes.

INLAND STEEL COMPANY

30 West Monroe Street • Chicago 3, Illinois

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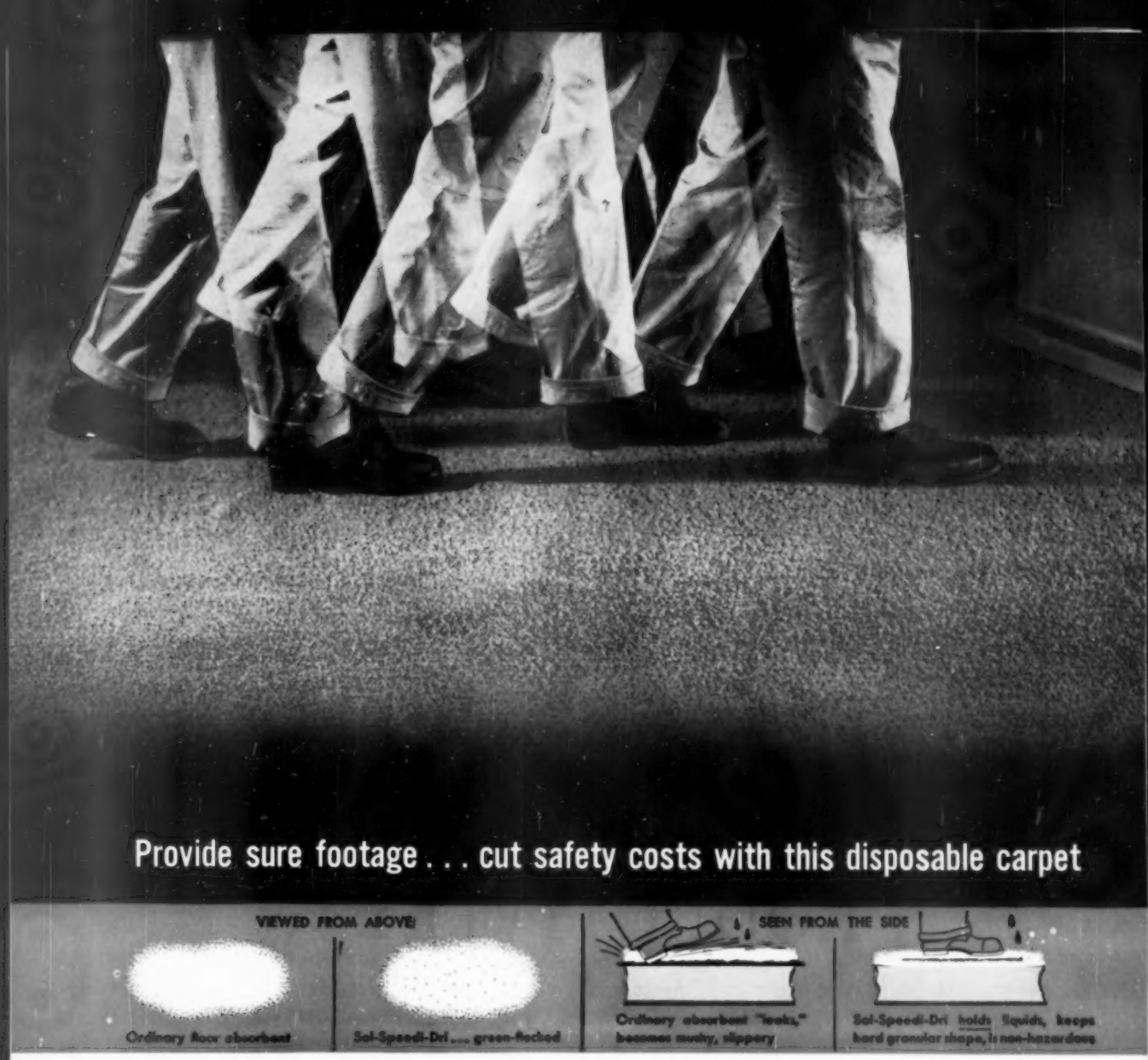


Provide sure footage . . . cut safety costs with this disposable carpet

VIEWED FROM ABOVE
SEEN FROM THE SIDE
Ordinary floor absorbent
Sol-Speedi-Dri . . . green-flecked
Ordinary absorbent "leaks," becomes mushy, slippery
Sol-Speedi-Dri holds liquids, keeps hard granular shape, is non-hazardous

Do you know how much slippery floors can cost? Statistics show that falls cause approximately *18%** of all compensable work injuries. Let's be more specific—figure out how much falls cost in your plant:

Enter here your total compensation claims _____ × 18%* = _____ This is the figure that can be reduced by using Sol-Speedi-Dri

**% of injuries caused by falls*

Moreover, *one* out of every 4 days lost to accidents is the result of a fall. You can cut compensation costs and lost time by using a *good* floor absorbent. Sol-Speedi-Dri is a *good, safe* floor absorbent because it *thoroughly* absorbs and retains all liquids and stays granular and slip-resistant . . . it's the most dust-free absorbent made. This can be easily demonstrated.

Look in the Yellow Pages under *Absorbents* or *Oil and Grease Absorbents* for your nearest Sol-Speedi-Dri distributor. Large, free sample of Sol-Speedi-Dri for the asking—no obligation.

USE A GOOD MINERAL FLOOR ABSORBENT

SOL-SPEEDI-DRI

SPEEDI-DRI DIVISION / MINERALS & CHEMICALS CORPORATION OF AMERICA, MENLO PARK, NEW JERSEY

U. S. Government study finds

AIR CONDITIONING PAYS OFF WITH 9% INCREASE IN PRODUCTIVITY

The findings reported in this advertisement are of great significance not only to the air conditioning industry but to employers and employees everywhere. A copy of the study in its entirety will gladly be mailed upon request.

Carrier Corporation · Syracuse, New York

Do workers produce more in air conditioned space? If so, is the increase enough to make air conditioning pay off?

Today more than ever before commerce and industry are vitally interested in the answers to these questions—but no more so than the Public Buildings Service of the U. S. General Services Administration, responsible for maintaining and operating 74,000,000 sq. ft. of space.

In a just-published document of far-reaching significance entitled "Influence of Air Conditioning on Work Production" the government agency states: "We know, from our previous studies, that a seven-minute saving in time per employee per day will more than pay for the expense of an air conditioning system. In other words, if work production increases only 1.5 percent per year, the system will pay for itself through savings in salaries."

But how much of an increase in productivity does air conditioning actually deliver? Past studies left room for conjecture because of other environmental changes—lighting, acoustical treatment and the like—made at the time air conditioning was installed. So the Public Buildings Service decided to conduct a test of its own, under carefully controlled conditions. Here is how they went about it.

Air Conditioning Only Variable

Two large office spaces were selected, in each of which thousands of clerical "searches" are conducted year after year. One area was air conditioned; the second was not. But in all other respects the two were identical—including lighting, painting, the number of employees (70) who worked in each, average age and distribution between men and women.

For five months—May through September 1957—painstaking records were kept on work rates, number of errors and absenteeism in both groups. As for the results, the report states, "Does air conditioning increase work production? The answer to this important question definitely is 'yes'. The work output of employees in an air conditioned space is greater, on the average, by more than nine percent than that of employees in similar space which is not air conditioned."

Absenteeism Reduced

Air conditioning also has an important bearing on absenteeism. Says the report:

"Accurate records were kept of all sick leave taken and its causes. All absences positively not associated with air conditioning (fractured bones, operations . . . etc.) were disregarded. In the non-air conditioned space, the absenteeism was 2.5 percent higher than in the air conditioned space."

Other benefits of air conditioning on the basis of the evidence were:

"A slight decrease in errors (0.9 percent).

"A measurable decrease in employees' living expenses (savings on cleaning bills, hairdos, make-up, etc.).

"An important contribution to employee comfort and morale."

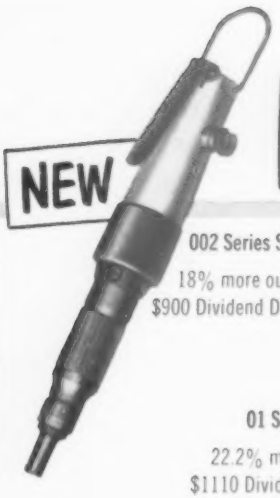
Over-all Conclusion

The concluding section of the report reads in part: "It is safe to assume that in any other type of office work, where the rate of production is not standardized, or where no minimum requirement must be met consistently, the increase in productivity will be more than enough to pay for air conditioning through savings in employee salaries."

3 NEW SERIES IR SCREW DRIVERS

give you an ANNUAL DIVIDEND on your PAYROLL DOLLARS

NEW **DESIGNS**
SPEEDS
POWER



002 Series Screw Driver
18% more output . . . for
$900 Dividend Dollars/year.

01 Series Screw Driver
22.2% more output . . . for
$1110 Dividend Dollars/year.

0002 Series Screw Driver
75% more output . . . for
$3750 Dividend Dollars/year.

If your operators are using older model screw drivers, you can increase their man-hour productivity by as much as $3750 Payroll Dollars in one year, just by replacing the older tools with one of the three new I-R designs.

Multiply these *Annual Dividends* by the number of screw driver operators in your plant, and you can see why management today is taking a new look at portable tool operations.

There's a fast, easy way to calculate the amount of *Dividend on Payroll Dollars* these new I-R screw drivers can help you earn in just one year—without adding to your present payroll.

It's yours without obligation. To get it, call your I-R AIRengineer today. Or write Ingersoll-Rand, 11 Broadway, New York 4, N. Y.

Ingersoll-Rand

Tools plus AIRengineering increase output per man

8-925

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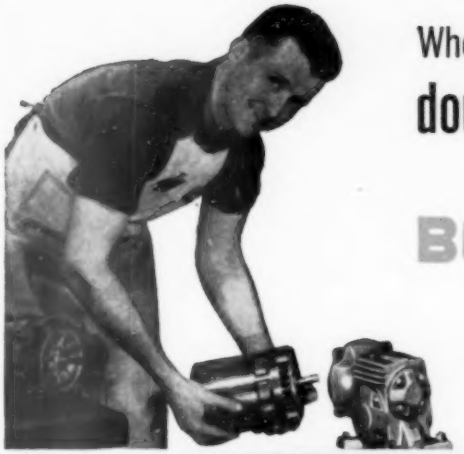
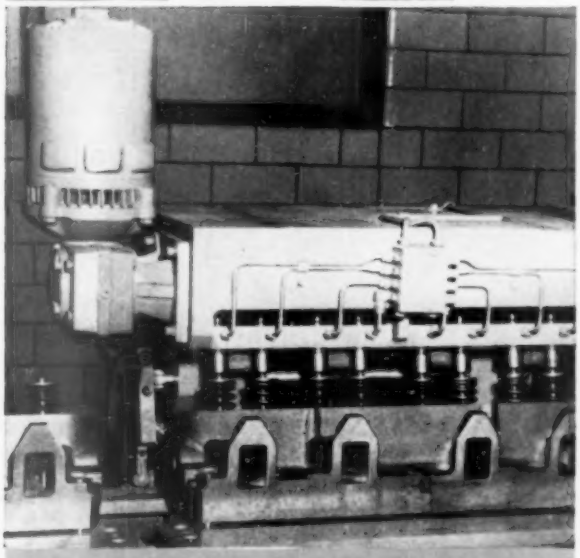


Where continuous automatic operations demand double insurance against downtime

the leading choice is standardized

BOSTON Gear SPEED REDUCERS

NO DOWNTIME for motor repairs. The standard end-mounted motor on BOSTON Gear RATIOMOTORS is easily detached by removing the bolts holding the motor to the gear unit flange. A spare motor can be attached, and operations resumed in a few *minutes*. Gear unit remains undisturbed, preserving alignment.



BOSTON Gear Vertical Right Angle **RATIOMOTOR** drives the valve "popping" (final test) unit in a giant 29-station transfer machine for continuous automatic assembly of cylinder heads.

BOSTON Gear Horizontal Right Angle **RATIOMOTORS** drive magnetic belts which convey parts from lower storage bins to vibratory hoppers at start of 13-station, automatic assembly of roller skate wheels.

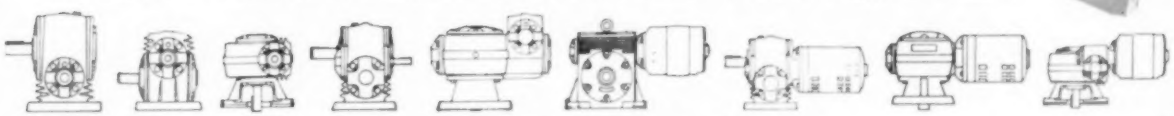
BOSTON Gear RATIOMOTORS are the leading choice for all types of installations where downtime would be disastrous to production schedules. One reason is BOSTON Gear quality standards, which assure highest efficiency and extra service life of the gear unit. Another is BOSTON Gear design leadership like the detachable motor which permits continued operation with a spare, avoids downtime. Design around BOSTON Gear RATIOMOTORS for this *double* insurance against downtime. All types and ratios are *standardized stock* models, quickly available anywhere from over 100 BOSTON Gear Distributors. Boston Gear Works, 62 Hayward Street, Quincy 71, Massachusetts.

Advt. copyright by Boston Gear Works

From Stock!
AT YOUR NEARBY BOSTON Gear DISTRIBUTOR

STANDARDIZATION PAYS

REDUCTORS — RATIOMOTORS — FLANGED REDUCTORS — Catalog lists 1605 types and ratios



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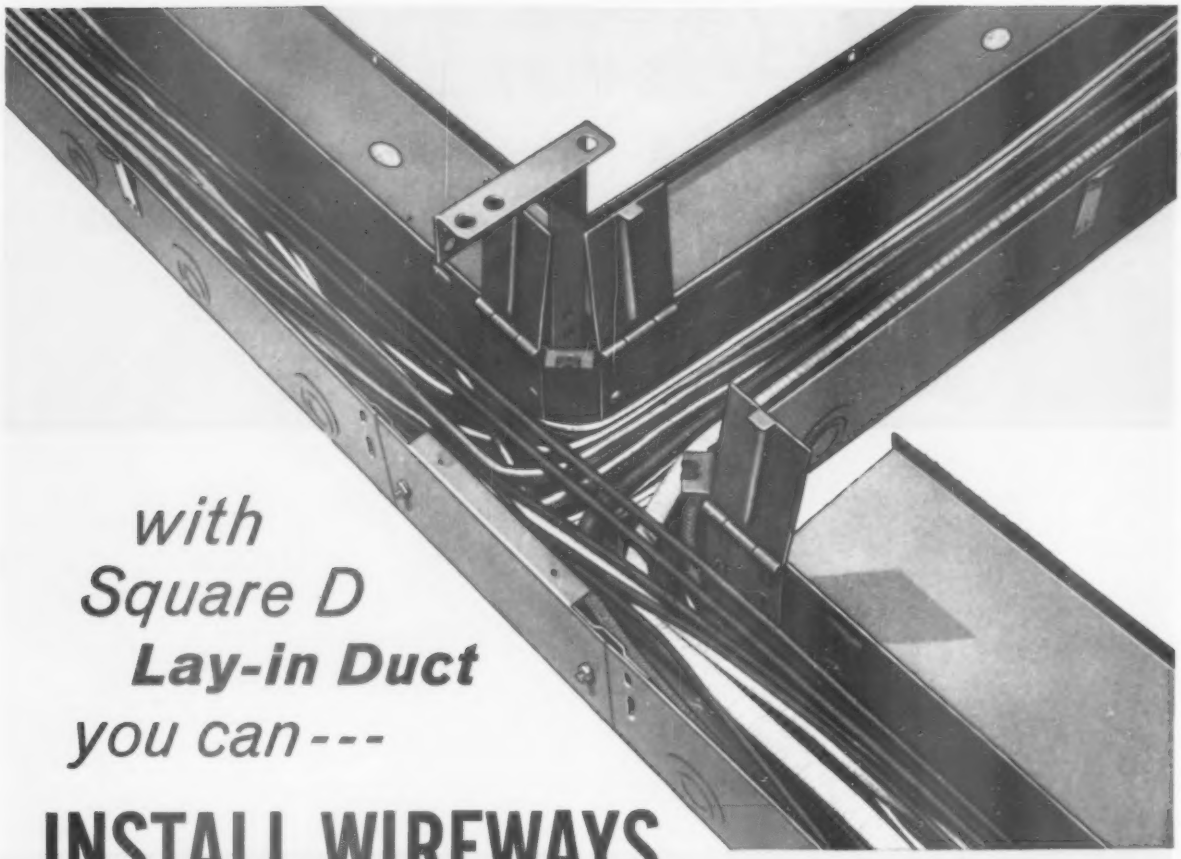


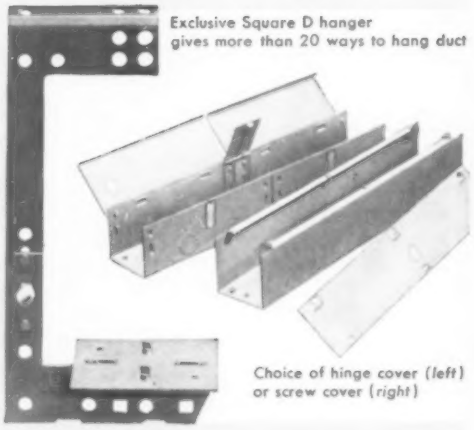
with
Square D
Lay-in Duct
you can---

INSTALL WIREWAYS FASTER AND AT MUCH LESS COST!

Before you decide to install conduit on a job, check to see if you shouldn't be using *Lay-in Duct* instead. Experience shows that in 1 out of 7 cases, the job can be done faster and at substantially less cost with *Lay-in Duct*.

Not only that, but *Lay-in Duct* makes it easy to add extra circuits later on, makes machinery circuits readily accessible, makes it simple to modify layouts. *Lay-in Duct* is completely reusable, requires less labor on multiple circuits.

You get extra advantages when you use SQUARE D *Lay-in Duct*. You can choose from two types—hinged cover or screw cover—and from the most complete line of fittings available. All fittings can be used with either type. You get the fastest installation—quick couplings. The exclusive Square D hanger gives exceptional flexibility—provides more than 20 ways to hang Square D wireways. You get real rigidity, too—joint design triples duct strength. Available in four sizes—2½, 4, 6 and 8 inches.



Exclusive Square D hanger gives more than 20 ways to hang duct

Choice of hinge cover (*left*) or screw cover (*right*)

Write for Lay-in Duct literature. Address Square D Company, 6060 Rivard Street, Detroit 11, Michigan

SQUARE D COMPANY

—wherever electricity is distributed and controlled

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Clean, sanitize, and Jenolize without fumes, flame, or excess water . . .

New All-Electric Hypressure Jenny!

Anywhere that flame, fumes, or excess water are objectionable or hazardous, the new Model E-350 All-Electric Jenny® will solve the cleaning or sanitizing problem. And with the new Jenolizing Process, machinery, equipment, and parts are left with a coating that protects against flash rusting, and gives a glossy, like-new appearance to painted surfaces.

Model E-350 combines the right amounts of heat, pressure, and cleaning solution to handle the majority of cleaning jobs at savings of up to 80% in time and labor costs. Its compact size, portability, low water output, and quiet operation without flame, smoke, or fuel fumes, make it ideal for use practically anywhere in the plant.

Send the coupon today for complete information. You'll welcome the outstanding performance of E-350—and the attractive plan which permits you to prove to yourself the economies of this new All-Electric Jenny.

Perfect for

manufacturing plants, food processors, textile mills, chemical and pharmaceutical plants, metal working and fabricating, petroleum industry, canneries, hotels and institutions, and every other operation where fumes, smoke, excess water are objectionable.

Mail Today!

86

Please send complete information on new E-350 All-Electric Jenny and Jenolizing.

Name ..... Title .....

Company .....

Address .....

City ..... Zone ..... State .....

hv

HOMESTEAD VALVE MANUFACTURING COMPANY

Hypressure Jenny Division, P. O. Box 86, Coraopolis, Pa.

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Change to a brand new imprint in less than 10 seconds!

IS YOUR MARKING THIS *FAST*— *FLEXIBLE AND ECONOMICAL?*

Fast imprint change in marking your products, packages, components or labels is far more than just a "convenience" feature. It can be the key to the efficiency of your *whole marking operation.* It helps you keep shipments *matched to demand . . . saves valuable floor space* by eliminating completely pre-marked inventories . . . *cuts machine down-time and boosts operator productivity,* often saving thousands of dollars annually.

And the fastest, most flexible method of changing imprints is a Markem Masterplate with type inserts for variables. In seconds, your machine operator slides out the Masterplate, lifts out the old type, drops in the new – without using a single tool, special skill or making a single readjustment. That's all there is to it!

Virtually every industry now uses Markem machines – equipped with Masterplates when frequent imprint change is necessary, and with other printing elements when different, specialized identification and decoration marking requirements must be met. These various direct, offset and screen process printers add more flexibility by marking a *range of sizes* . . . and many of them offer a *range of marking speeds* when equipped with automatic feeds and take-aways.

There's an experienced Markem man near you who'll be glad to study your needs, then provide you with practical, money-saving marking recommendations. Call him in – or write Markem Machine Co., Keene 18, N. H.

MARKEM

EVERYTHING INDUSTRY NEEDS . . . FOR PROFITABLE MARKING . . . SINCE 1911

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For more facts Circle 489 on Reader Service Card ➤

Put this truck to work . . . without buying it!

For many companies, even the savings resulting from the use of the *right* equipment is overshadowed by the capital investment necessary. The logical answer, in such a case, is to lease.

Without tying up a cent of working capital, the Clark Lease Plan permits you to select materials handling equipment from the world's *most* complete line. No down-payment or outside financing is necessary, and you have the added advantage of dealing directly with your local Clark dealer.

The savings the equipment brings are usually greater than the leasing rate. In fact, most users of the Lease Plan find the cost-cutting factors of using modern handling equipment *far outweigh* the modest monthly rates. For a detailed brochure giving full particulars of the Clark Lease Plan, simply write: Leasing, Clark Equipment Co., Battle Creek, Michigan.

CLARK® EQUIPMENT

...U.S.A.

Tuffy Tips —on safe use of Slings and Hoist Lines

Safety in Hoisting Saves Costly Injuries

During a recent 12-months' period lost-time back injuries reported in one state (California) totaled 32,643. Lost-time injuries caused by strain or over-exertion: 24,639. A high price to pay—in misery and money—for lifting, pushing or carrying loads. Medical aid and compensation costs of materials handling accidents run far into the millions every year. Proper hoisting equipment, properly used and maintained, is one important answer to this problem. It may save your workers disabling injury, and save you expensive absenteeism and lost production.

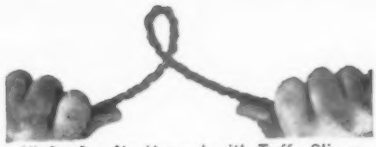
Rules for Safe Use of Hoists

1. **DON'T LET MUSCLES** do what a proper size hoist should do.

2. **SMALL HOISTS** aren't expensive. With proper slings and hoist lines, they will help greatly in reducing injuries to workers.

3. **USE THE RIGHT SLING AND HOIST LINE** for the job. Tuffy Slings and Hoist lines are "tailored" to every need, from the smallest block and tackle to giant cranes and other equipment.

4. **DON'T ASSUME** that all slings are right for all kinds of lifting. Your Tuffy distributor will help you select the right ones.



Kinks Are No Hazard with Tuffy Slings

One of the first rules of safety: never use a *wire rope* sling that has been kinked. Not so with Tuffy Slings. Tuffy's patented, 9-part machine-braided fabric is just about impossible to kink. And if it should, it's easy to straighten out the kink, leaving no material damage.

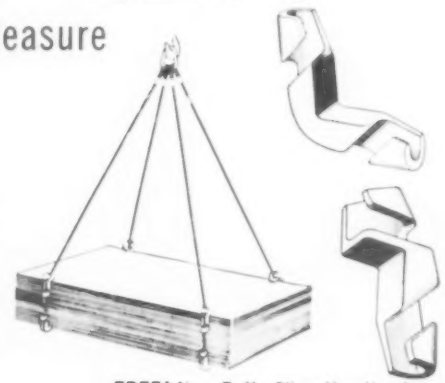
Unique Ferrule Gives the Eye Splice Full Fabric Strength

The steel ferrule is slipped over the tuck-splice of the sling eye and pressed on under tremendous pressure. It gives the eye splice 100% of fabric strength. No abrupt edges or rough projections to injure hands and slow down work. And there's no extra cost for this extra efficiency and safety feature!

Proper Fittings Are An Important Safety Measure

Fittings used on Tuffy Slings are designed for a broad and varied range of needs. Your Tuffy distributor, or Union Wire Rope engineers, will be glad to advise you on the correct fittings for greatest service and safety for any wire rope rigging.

Shown here are Newco Sling Saddles, fittings that are widely used to protect loads and lengthen the life of slings. These saddles are made in two types: Type B and Type T. Both are shown in the illustration. Type T is used at the top of the load; type B at the bottom. They can be changed quickly from one sling to another. They eliminate the strand cutting that occurs around 90° edges and protect the load. Full data on dimensions and weights for Newco Sling Saddles—and the full line of sling fittings—are included in the Tuffy Sling Handbook that's yours for the asking (see below).



FREE! New Tuffy Sling Handbook

Revised, enlarged edition. Covers slings and sling fittings from A to Z. Gives types, dimensions, weights and rated loads. Send for your copy now. Address **Union Wire Rope Corporation, 2234 Manchester Ave., Kansas City, Mo.** Specialists in high carbon wire, wire rope, braided wire fabric, stress relieved wire and strand.

Use Tuffy Hoist Line for Greatest Economy and Safety

Tuffy Hoist Line and Tuffy Slings are the ideal team for efficient hoisting at lowest cost per ton-mile. The extra strength, toughness and service life we build into the Tuffys cost you nothing extra.

Your Tuffy Distributor Offers the Most in Service and Savings

UNION Wire Rope

S-5

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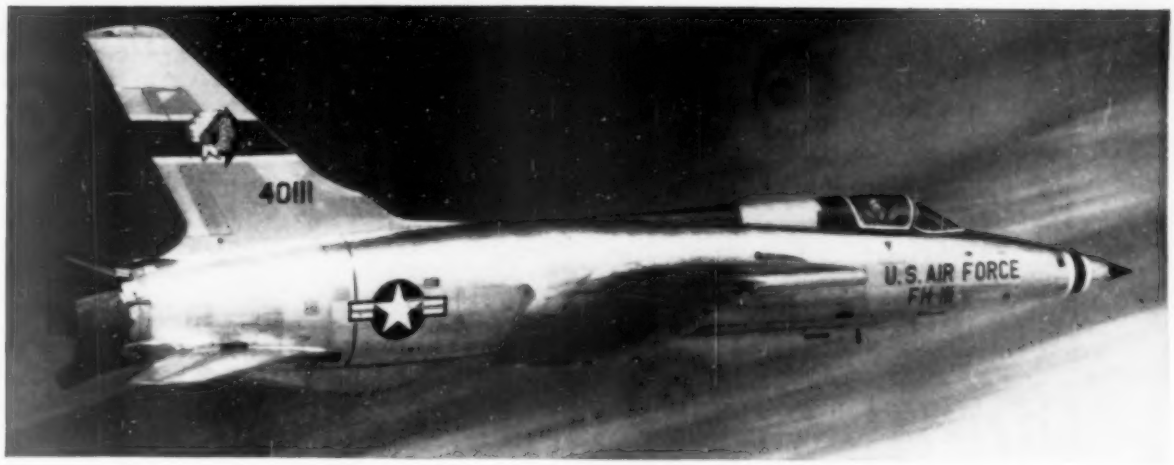

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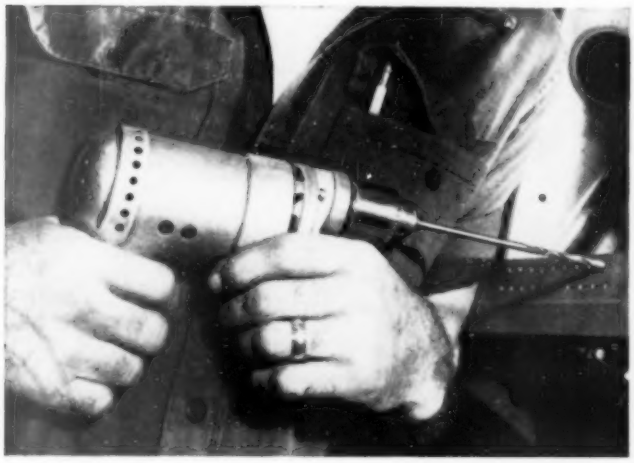
The REPUBLIC F-105 THUNDERCHIEF..."World's most powerful one-man Airplane"



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NOW! *One new, brighter 40-watt lamp does the*

2800

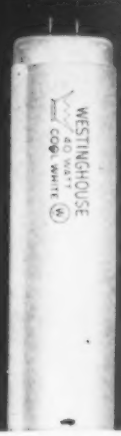
NEW "UNIVERSAL" PREHEAT-RAPID START LAMP

more light per dollar

YOU GET — FROM WESTINGHOUSE

3200 LUMENS
(cool white)

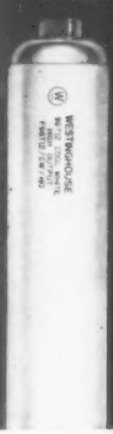
In the highest-rated 40-watt lamp



Get 21% more light using your present rapid start fixtures . . . 3310 lumens in white and warm white! The new "Crestline" is the only fluorescent with no "lazy ends"—even the bases let light through (optional at slight extra cost). Life rated at 7500 hours at 3 hours per start.

9000 LUMENS
(cool white)

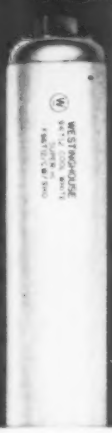
in the brightest 96" High Output lamp you can buy



Light output improved 23% over present H.O. type (High Output) lamps to make this the most economical 96" H.O. type lamp ever developed for application where high output lamps are used . . . 9300 lumens in white and warm white. This brightest of all 96" H.O. type fluorescents is rated at 7500 hours' life—more than 2 years' use in the average installation—and they're designed to operate on present 96" H.O. ballasts.

15,000 LUMENS

in the economical 96-in. (Super-Hi™) type lamp



New ballast equipment and improvements in lamp design have increased the light output of this single 8-foot S.H.O. lamp to 2½ times that of ordinary lamps. Smooth, tubular surface can't accumulate dust and cut down light. Rated at 7500 hours' life.

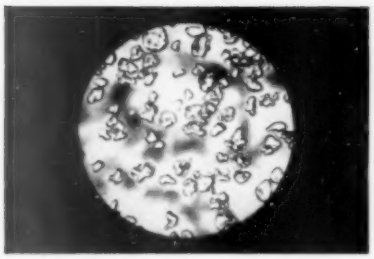
job that two different types have been doing!

LUMENS
(COOL WHITE)

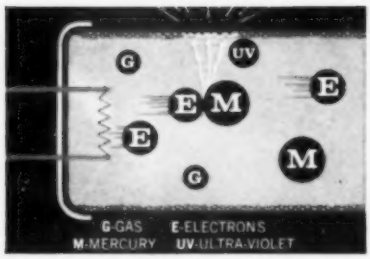
Simplify stocking, ordering and maintenance by specifying this one 40-watt fluorescent lamp for the job that two different types have been doing! The new Westinghouse "Universal" lamp can be used on either your present rapid start or preheat circuits with no loss in lumen output. You'll save storage space; save time and error in maintenance by stocking this one lamp.

Whether you're planning or expanding, you can use this lamp in your new fixtures, as well as in your existing ones. And here's the best news of all: light output has been increased to 2800 lumens, while the list price has been *reduced* to only $1.25—5¢ less than old style rapid start lamps!

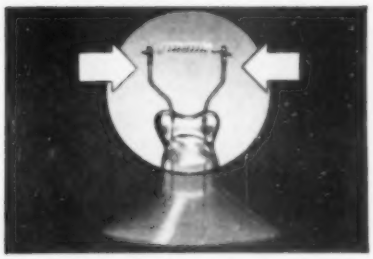
Only Westinghouse brings you these 6 LIGHT-BOOSTING ADVANCES



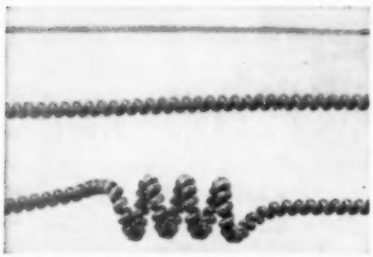
Ultralume™ Phosphors: Westinghouse research has proved that the size of the individual phosphor particles which coat the inside of a fluorescent lamp have a direct effect on the amount of light given off. Now, a new and exclusive Westinghouse process selects the right particle size for more efficient light-producing phosphors.



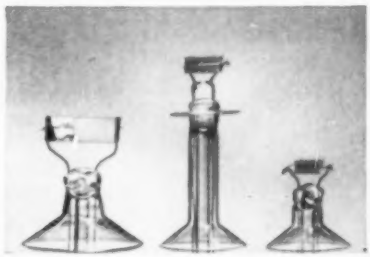
Mixed Gases: All fluorescent lamps contain mercury and gases. The gases serve as conductors until the mercury is vaporized. These gases and mercury vapor then convert electricity into ultra-violet radiation, which causes the phosphors to "fluoresce." Westinghouse uses the right mixture and pressure for each type of fluorescent lamp.



Plated Leads: The electron bombardment inside a fluorescent tube eventually causes particles of the metal supports and leads to sputter off causing "end blackening." To prevent this, Westinghouse plates the lead wires with super-hard chrome-vanadium. Result: tubes that *stay* brighter, end to end.



Triple Coiled Electrodes: Westinghouse uses triple wound electrode coils to hold the right amount of emission material. This carefully measured amount is heated quickly and adequately protected from bombardment to insure long life and trouble-free starting.



"Custom" Anodes: Anodes act as buffers and prevent excessive "sputtering" of emission material from the electrodes. Since the electrical characteristics are different for each type of fluorescent lamp, Westinghouse anodes are especially engineered to fit the electrical requirements of each type of lamp.

Silicone "Raincoats": In high-humidity areas, moisture can collect on the exterior surface of the lamp and prevent it from starting. To protect against moisture accumulation, Westinghouse fluorescents are given a special Silicone coating, or "raincoat," which disperses this film into harmless droplets.

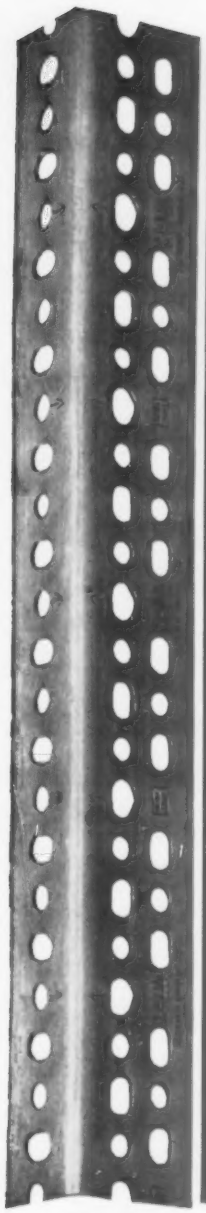
CONTACT YOUR LOCAL WESTINGHOUSE LAMP AGENT, OR WESTINGHOUSE LAMP DIVISION, BLOOMFIELD, N. J.

These new fluorescent advances are made possible by the same Westinghouse Research which brought you . . .

NEW SHAPE . . . NEW LIGHT . . . WESTINGHOUSE EYE SAVING WHITE BULBS . . . *Another reason why—*

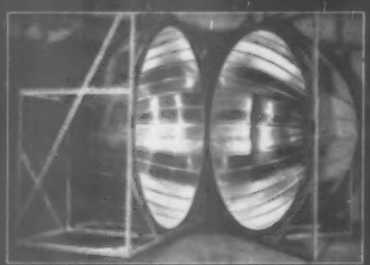
YOU CAN BE SURE... IF IT'S Westinghouse

whatever your ideas suggest– build it with NEW AIM BRAND SLOTTED ANGLE



SO STRONG—AIM Brand Slotted Angle is ideal for building heavy-duty equipment, such as this automobile display rack.

SO EASY—AIM Brand Slotted Angle simplifies construction of storage equipment, such as this pallet rack with catwalk.



SO VERSATILE—This unusual street light testing device is another idea application of AIM Brand Slotted Angle.

There's practically no limit to what you can build with new AIM Brand Slotted Angle—the only framing material that gives you Lock-Joints, Friction-Joints and ⅜″ structural bolts.

The new, scientifically-spaced, slot-and-hole bolting pattern lets you meet all your building equipment needs with less manhours, less material and with greater structural strength. For normal construction and good rigidity, Friction-Joints are formed by bolting through the slots. For maximum strength and rigidity, ⅜″ structural bolts with full load shoulders fit round holes to form Lock-Joints. Each bolt has a safe load capacity of 2000 pounds, and can be applied with an ordinary or a power wrench.

As your needs change, AIM Brand Slotted Angle can be dismantled to be re-used again and again. This versatile framing material is available in two sizes: Standard 225-80 (2¼″ x 1½″ x .080″) and Heavy-duty 300-104 (3″ x 1½″ x .104″). Packaged in 10 pieces of 10 or 12-foot lengths with nuts and bolts.

Cold-rolled galvanized steel, AIM Brand Slotted Angle is a product of Acme Steel Company, U. S. pioneers in slotted angle framing material. Available nationally through leading distributors or write: Dept. FAD-109, Fabricated Materials Division, Acme Steel Company, 135th Street and Perry Avenue, Chicago 27, Illinois.

ACME STEEL

AIM Brand Slotted Angle

AIM BRAND

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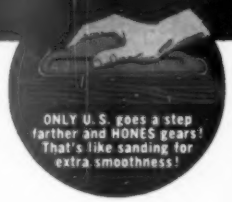
Now U.S. hones gears to superfinish

for:

SMOOTHNESS
QUIET RUNNING
LONGER LIFE

HOBBING gears is like SAWING WOOD. All gears are hobbed.

SHAVING gears is like PLANING. Some makers shave gears.

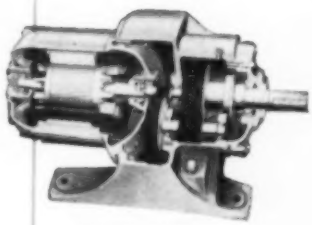


ONLY U. S. goes a step farther and HONES gears! That's like sanding for extra smoothness!

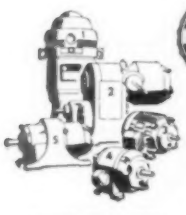
another reason to specify:

U.S. Syncrogear Motors

Among the makers of electric gearmotors, only one – U.S. Motors – *hones* gears to assure extremely accurate profile and smoothness. This honing means quiet running and longer life. Gear hobbing, the necessary first step in cutting gear teeth, leaves a degree of roughness analogous to sawing wood. Many gear makers go no further. Some, however, shave the gear teeth before hardening. This leaves a surface analogous to planing wood. The ultimate refinement in tooth profiling, however, is honing – which may be likened to sanding of wood. This takes place *after* gear teeth are hardened. Thus, it takes out any imperfections and minor heat-treat distortions. It is to assure precision and exclusive refinements such as this that U.S. makes its own gears. Another good reason to specify: "U. S. SYNCROGEAR MOTORS." (⅓ to 50 H.P.)



SEND FOR FREE SYNCROGEAR MOTOR BROCHURE No. F-1880, *explaining the Syncrogear principle. Color illustrated.*



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LOS ANGELES 54, CALIFORNIA
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U.S. MAJOR MOTOR LINES INCLUDE:
1. Vertical Solid & Hollowshaft, 2. Varidrive, 3. Totally-Enclosed, 4. Uniclosed, 5. Syncrogear. Also, many other special motors.

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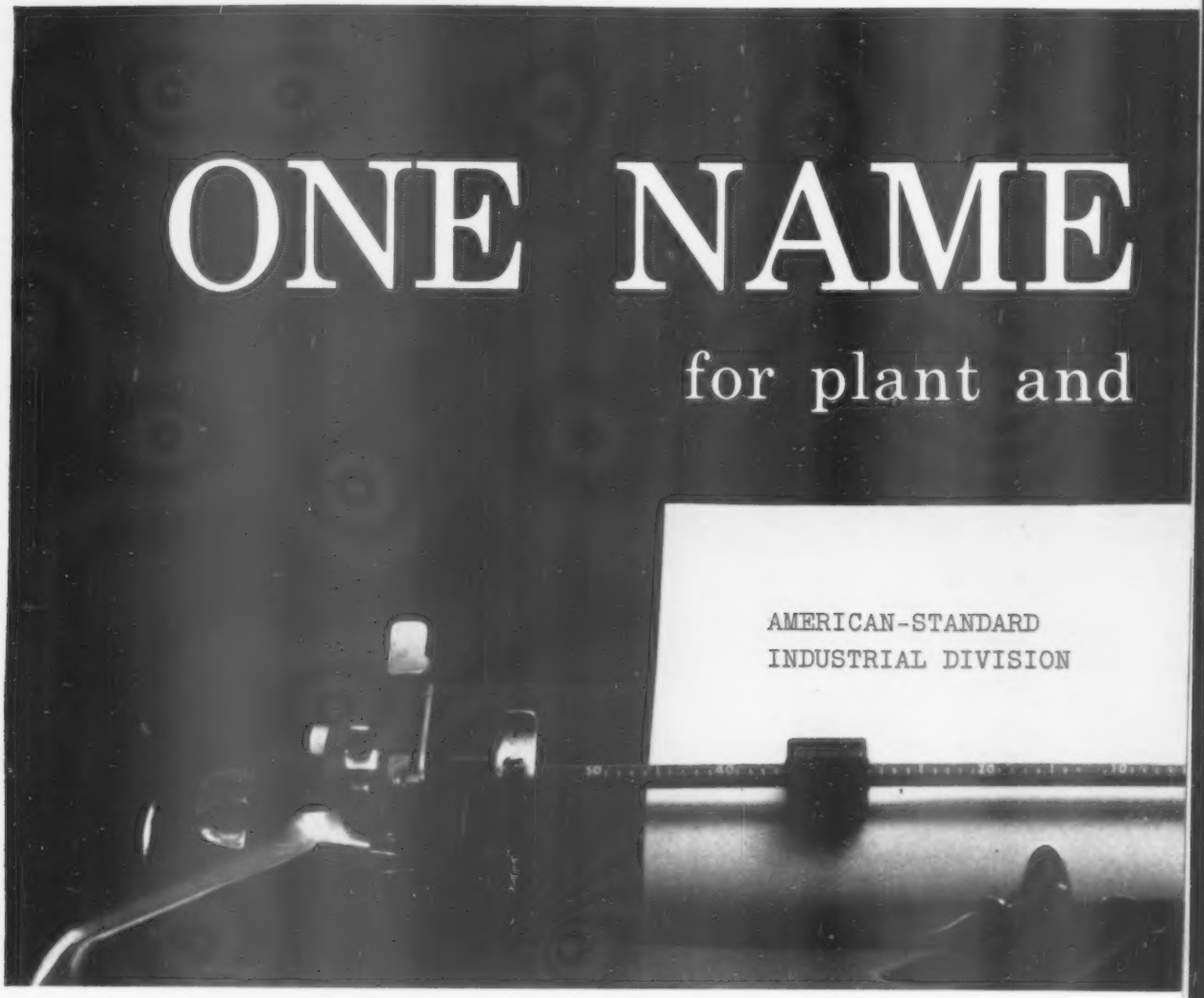
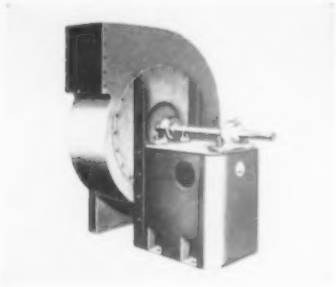
for plant and



Industrial fans with wheel types for handling air, gases, materials, shavings.



Self-contained ventilating units for supply or exhaust in duct systems.

Ventura® fans for heavy-duty ventilating move smoke, fumes quickly and quietly.

One call for all

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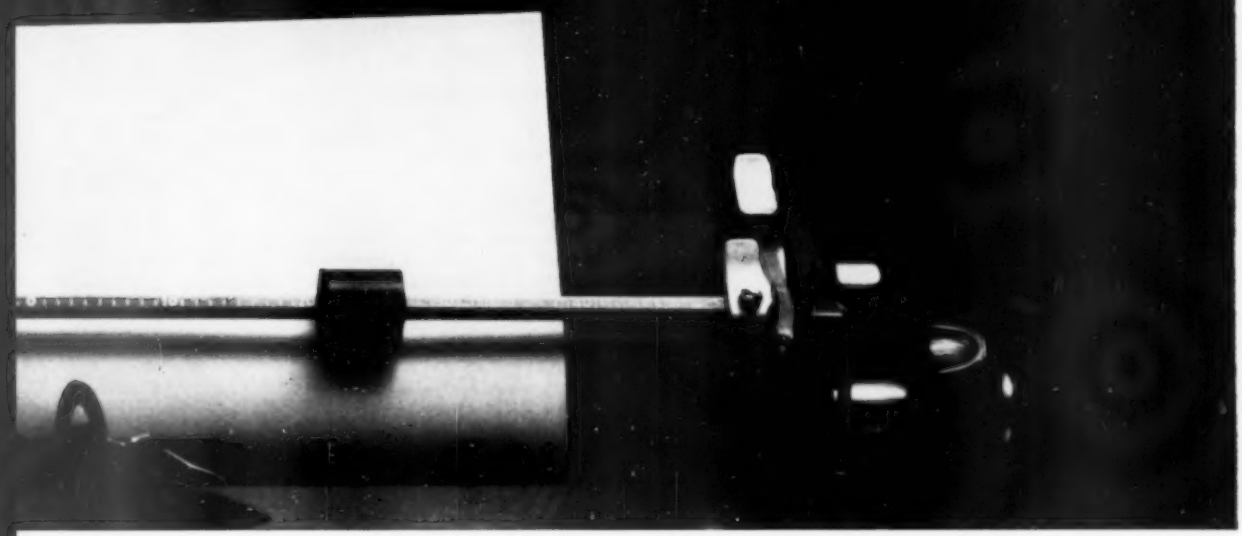
is all you need to know process air-handling equipment



American-Standard* Industrial Division is the name to know for air-moving equipment to handle *every* duty. For, American-Standard's complete line of precision-built equipment ranges all the way from propeller fans for spot ventilation to giant centrifugal compressors that supply vital high-pressure air in industrial processes.

The point is, American-Standard Industrial Division can supply all the components for an efficient plant and process air-handling system tailored to your needs. You deal with one organization. You get one-source responsibility for quality and performance in equipment designed, engineered, and manufactured to work together.

Get in touch with us. Offices in all principal cities are staffed by product specialists to assist with equipment selection and on-the-job problems. AMERICAN-STANDARD INDUSTRIAL DIVISION, DETROIT 32, MICHIGAN. IN CANADA: AMERICAN-STANDARD PRODUCTS (CANADA) LIMITED, TORONTO, ONTARIO.

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NEW

An exclusive *TRANTER advancement in heat transfer technology

MULTI-ZONE

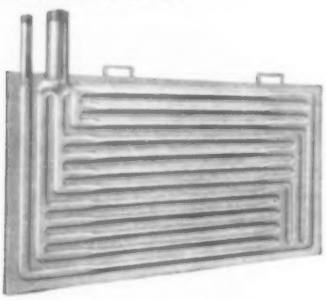
PLATECOIL®

DESIGN

*PATENTS APPLIED FOR

Years ahead performance plus all of the time-proven PLATECOIL advantages over pipe coils

The new MULTI-ZONE PLATECOIL features a multiple header configuration for improved steam distribution. The resulting increase in effective heat transfer area provides a built-in reserve capacity to deliver more heat during "start-up." It also speeds temporary recovery after introduction of work loads or processing ingredients for closer process control. Decreased condensate "trapping" produces FREE-FLO action.



OPERATING PRESSURES of 250 psi. now make it possible to apply the cost-cutting advantages of PLATECOIL to a new range of heat transfer problems. DURAWELD construction with TRANSTEEL mill-controlled mild steel provides a safety factor of 4 to 1 at 250 pounds steam.

Replace pipe coils with the new MULTI-ZONE PLATECOIL and save on tank space, fabricating, installation and maintenance costs. Factory-fabricated PLATECOIL is available in a wide variety of sizes and styles including single embossed, double-embossed, banked and rolled units in TRANSTEEL, Stainless, Carpenter 20, Monel, Hastelloy C and Nickel.

WRITE FOR NEW BULLETIN P60
for complete specifications and data.

Tranter Manufacturing Inc.

LANSING 9, MICHIGAN

PLATECOIL® DIVISION

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Why Be Satisfied With Just Any Brand of Trichlorethylene?

DETREX PERM-A-CLOR is Backed by Thousands of Man-Years of Metal Cleaning Experience

Why settle for just any brand of trichlorethylene when you can have DETREX PERM-A-CLOR applied to your specific job by DETREX engineers – industry's most qualified and experienced experts?

DETREX factory and field men, who specialize in metal cleaning processes, have a combined background of many thousands of man-years – devoted exclusively to every possible type of degreasing operation.

What's most important is that the benefits of all this experience are available to you. DETREX engineers stand ready to study and analyze your degreasing operation – and make recommendations that increase efficiency and worker productivity – that often effect solvent savings of 15% or more.

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Write for Dr. C. E. Kircher's informative article "Solvent Degreasing—What Every User Should Know"

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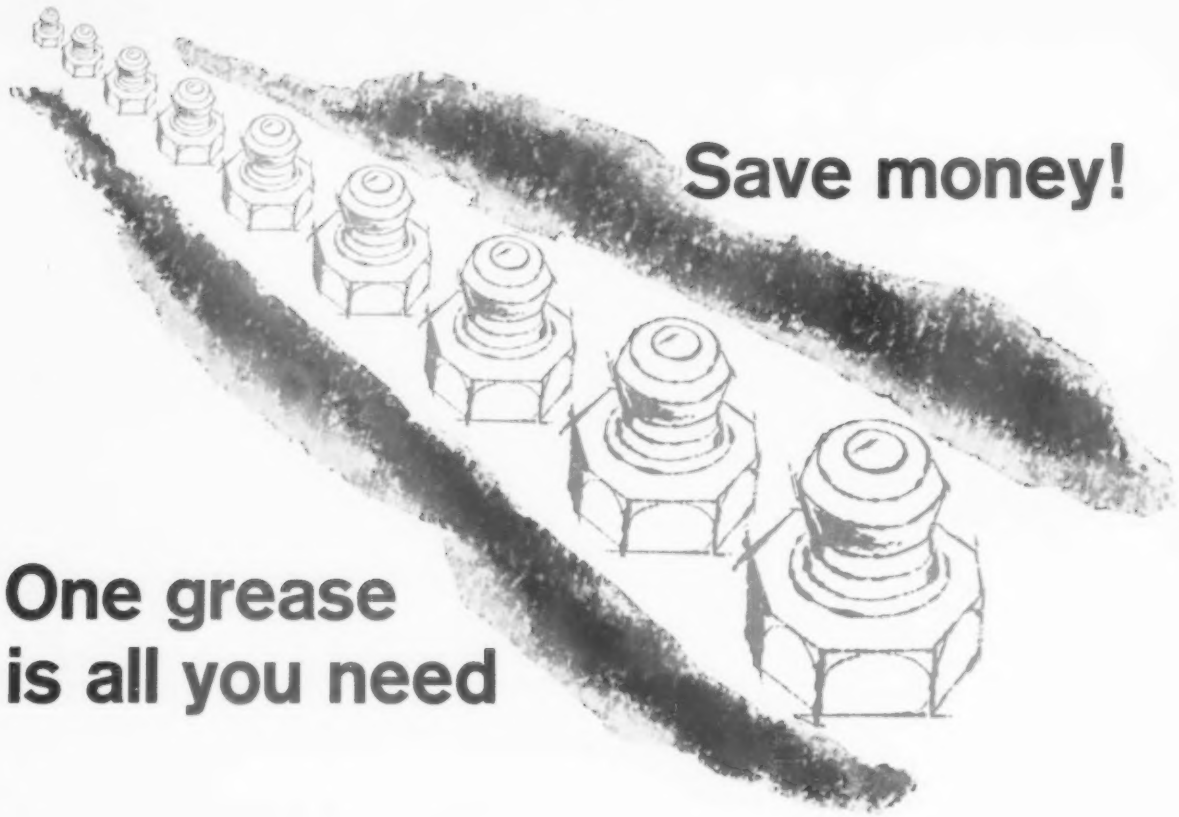

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One grease is all you need

If you use several greases to lubricate your plant equipment—stop! You'll save money with Sinclair Litholine® Industrial Grease because this one grease simplifies inventory, saves time. Recommended for all types of bearings. It has also earned an enviable reputation for high temperature bearing performance and mechanical stability. When management asks how you've cut costs, tell them you've switched to Sinclair Litholine and show them the results.

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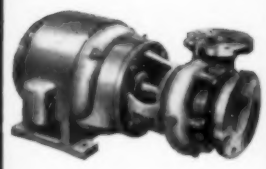
WHERE SPACE is a PROBLEM



"BUFFALO" CLOSE-COUPLED PUMPS

For high-performance pumping in a limited space your best answer is a "Buffalo" Close-Coupled Single Suction Pump. Here's why:

- Easy and Economical to Install: Wide flexibility in piping and mounting are provided by adjustable discharge angle and permanently aligned shafts.
- High Efficiency: Enclosed type impeller is designed for maximum pumping performance.
- Durable and Dependable: Sturdily built with heavy cast mounting brackets, husky shells, accurately machined impellers and deep stuffing boxes.
- Quiet, Smooth Operation: Careful static balancing of impeller assures smoothness, low noise level.
- Wide Range of Sizes and Capacities: 1" to 6" discharge sizes. Capacities up to 1100 gpm.

The next time you need clear water pumping efficiency to fit into close quarters, ask your "Buffalo" engineering representative for full details on "Buffalo" Close-Coupled Pumps. Or write for Bulletin 975-F.

"Buffalo" pumps bring you the famous "Q" Factor — the built-in QUALITY that provides trouble-free satisfaction and long life.

"Buffalo" PUMPS

BUFFALO PUMPS DIVISION OF BUFFALO FORGE COMPANY

471 Broadway, Buffalo, N. Y.

Canada Pumps, Ltd., Kitchener, Ont. • Sales Representatives in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

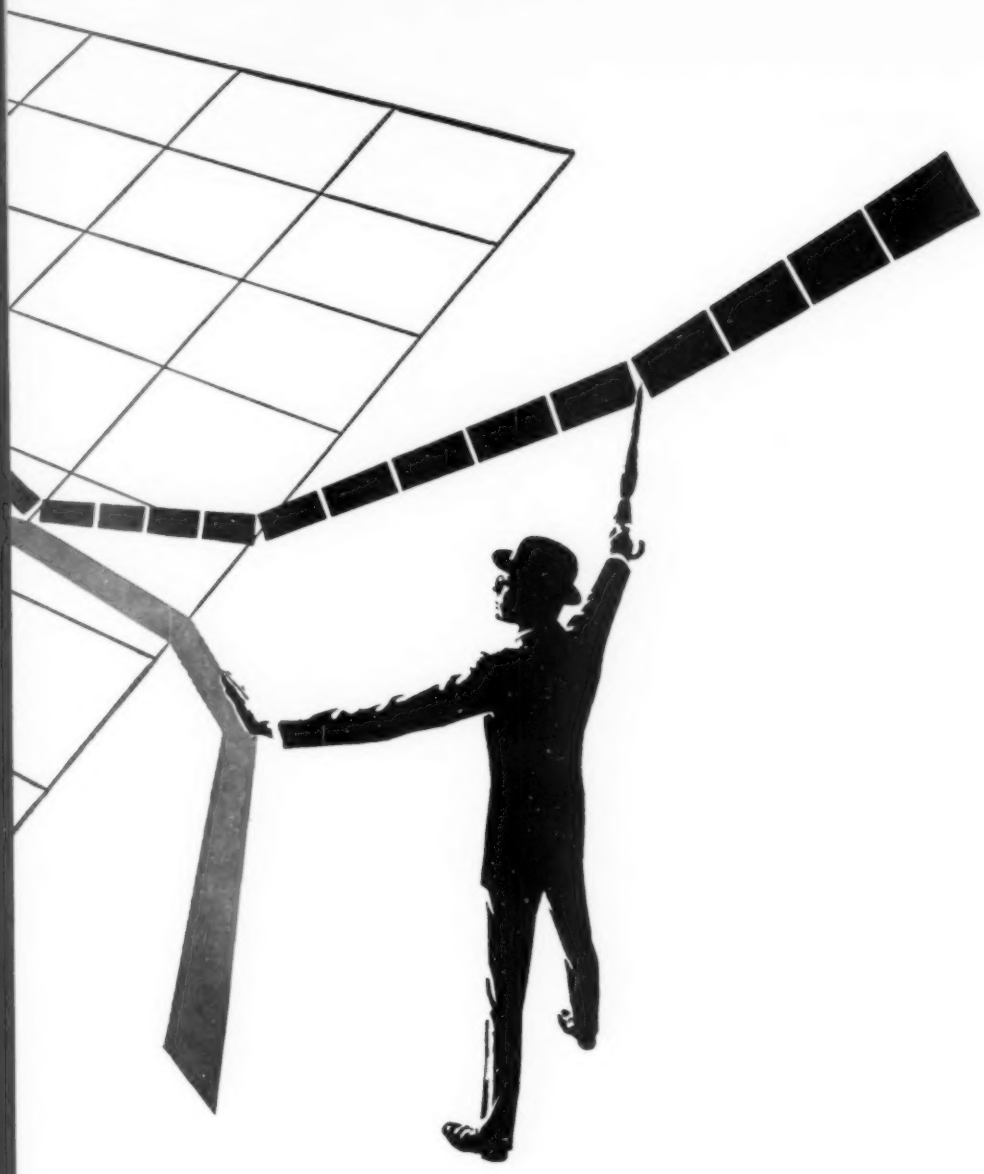
For more facts Circle 499 on Reader Service Card

The wrong-way curves that

Or how the friendly A_M man helped drop accidents to a new low, boost production 100% for an American Mutual Policyholder.

The factory's accident rate was spiralling and so was the cost of Workmen's Compensation. But production, profits and employee morale were nose-diving.

These were the facts facing the production-minded Safety Engineer from Mr. Friendly's Company—American Mutual—and here's what he did about them. After making a thorough safety analysis of the entire plant's operation, he found that an outmoded work process was the major cause of accidents. To eliminate the hazards, he recommended a modern process which was given a trial run. Production doubled while total man hours stayed the same. Accidents dropped to a new low while employee



turned out right!

and community morale shot up. Needless to say, insurance costs were substantially cut and the process was permanently adopted.

That's how American Mutual Safety Engineering works to help its thousands of policyholders save on Workmen's Compensation.* If your rates are high, isn't it high time you called in the *friendly* AM *man?* He can advise you on all your casualty insurance needs. American Mutual, Dept. F-6, Wakefield, Mass.

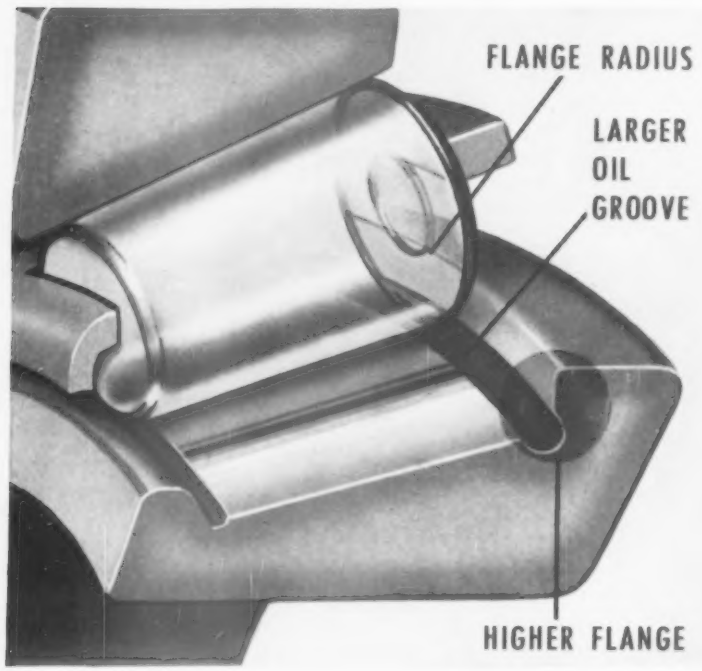
***Hamilton Paper Co. of Miquon, Pa.,** another AM policyholder who profited through good safety experience, saved $129,376 in 13 years (difference between manual premium for this industry and premium actually paid) . . . gained another $43,180 through AM mutual dividends.

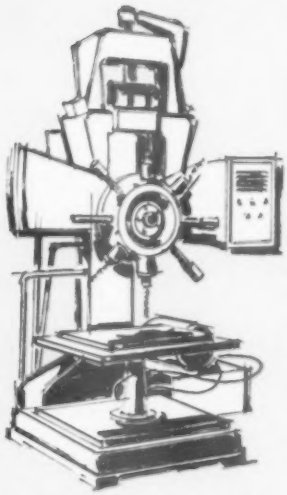
American Mutual

LIABILITY INSURANCE COMPANY

"The First American Liability Insurance Company" . . . a leading writer of Workmen's Compensation, all forms of Liability, Crime, Accident and Health Insurance.

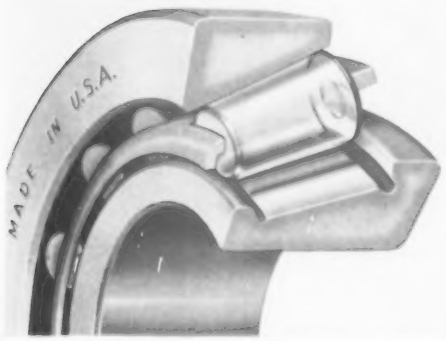
Better products, *faster*, from your Bearing Specialist:





FINE-TOLERANCE MACHINING calls for Bower Tapered Roller Bearings to hold pre-load better, stay in adjustment longer.

Bower designs 3 "long-life" refinements into one small section of tapered roller bearings



Bower Tapered Roller Bearings are *Spher-O-Honed*: 1. Roller heads are spherically contour-ground, need no "run-in"; 2. Oil groove is bigger for positive roller-head lubrication; 3. Honing superfinishes inner and outer races for longer life.

Extra-high flange, larger oil groove, shoulder radius—each helps reduce friction, provide long, maintenance-free service

Bower's skill at the design board pays a bonus in service life when tapered roller bearings go to work in your machines. Take for example these *three* design refinements in *one* small area:

1. Higher flange gives rollers a large, "two-zone" contact area, cuts unit pressure on each roller; it also improves roller alignment, thereby reducing wear and resulting "end-play". **2. Larger oil groove** insures positive roller-head lubrication; increases efficiency and decreases wear. **3. Flange radius** helps the oil groove maintain an unbroken film of lubricant on the roller heads. All three add up to longer bearing life, lower cost to you.

Whether you need tapered or straight roller bearings, check *first* with the Bearing Specialist who handles the Bower line. He stocks both types; gives fast delivery on each. Call today!

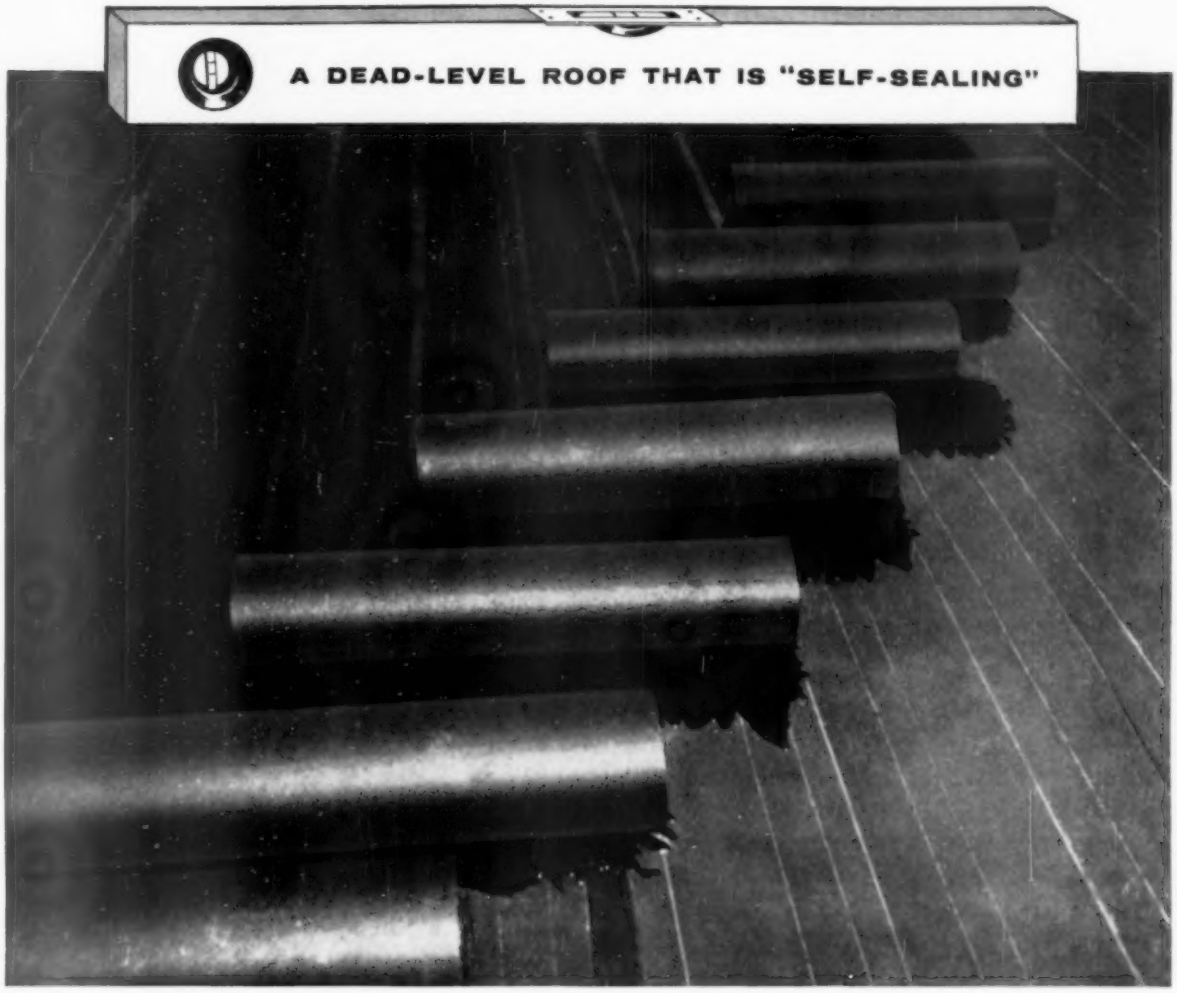
BOWER ROLLER BEARINGS

FEDERAL-MOGUL SERVICE

DIVISION OF FEDERAL-MOGUL-BOWER BEARINGS, INC. • DETROIT 13, MICHIGAN

BEARING BOWER ROLLER BEARINGS SERVICE

For more facts Circle 501 on Reader Service Card



Johns-Manville *Aquadam* Built-Up Roofs

Built with a bitumen that means better application—longer life

AQUADAM IS A SUPERIOR CEMENTING AGENT developed by Johns-Manville for dead-level roofs. It combines the best features of coal tar pitch and of asphalt without their weaknesses. It quickly cements and securely seals the felts. And, as years roll on, Aquadam retains its self-sealing properties.

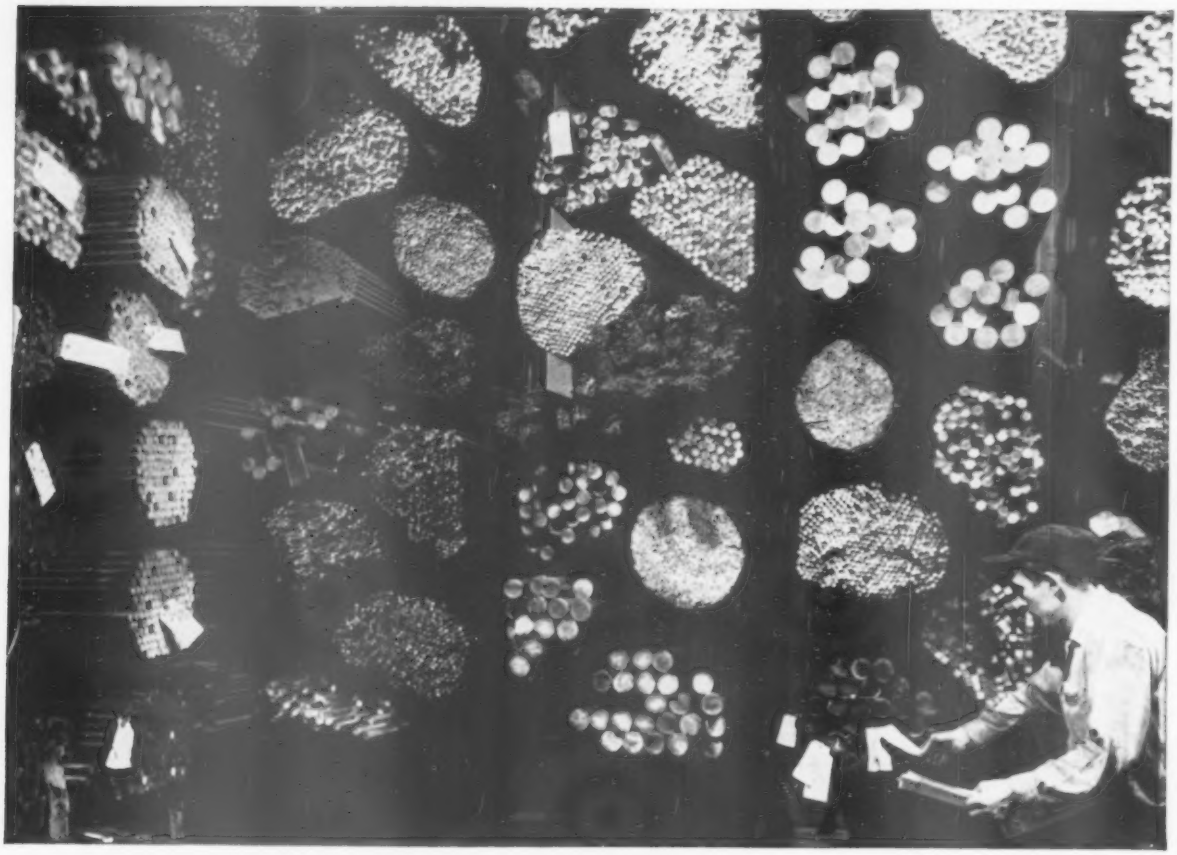
In addition, Aquadam offers these other proven advantages: ability to end "standing water worry"; high resistance to all kinds of weather conditions; "superior bond," because Aquadam spreads, wets and saturates the roofing felts uniformly.

For further information on how Aquadam Built-Up Roofs pay off in longer roof life and maximum protection send for a copy of booklet, "J-M Aquadam Built-Up Roofs." Write to: Johns-Manville, Box 158, New York 16, New York. In Canada, write Port Credit, Ontario.

JOHNS-MANVILLE

JOHNS MANVILLE JM PRODUCTS

For more facts Circle 502 on Reader Service Card



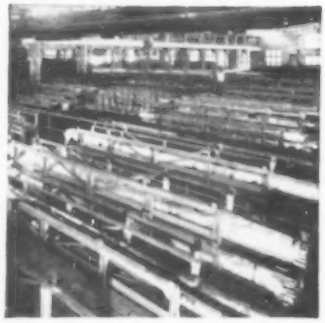
3-Point Check List

FOR USERS OF COLD FINISHED BARS

✓ ***SIZE RANGE.*** Size ranges on hand at Ryerson are second to none, even including hard-to-get intermediate sizes. Shafting . . . screw machine steel . . . accuracy stock . . . machinery steel—every type of cold finished bar awaits your call.

✓ ***Know-How.*** Every day Ryerson steel men—*specialists* in cold finished bars—are in touch with machining problems . . . latest techniques. This unequaled fund of experience is ready to serve you in selecting a steel that gives faster machining to closer tolerances . . . better finish.

✓ ***Reliability.*** Year in and year out your most reliable source for cold finished bars is Ryerson. Call today. Prompt, personal service from experienced steel men proves that Ryerson service saves you time and money on your order for a few bars—or a truckload.



Widest size range always on hand, even including hard-to-get intermediate sizes.

Shafting stock receives special care to insure protection of finish and straightness.

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NATION'S MOST COMPLETE SERVICE CENTERS IN PRINCIPAL CITIES COAST TO COAST

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FACTORY . . . PRESS TIME REPORT • OCTOBER 1959

Looking Ahead in Business

You can bet 1959 will close with a great flurry of business activity. Momentum now being built into the boom will boost output well into 1960.

Business is sure to get a big lift from inventory building in the months ahead. Additions to inventory played a strong role in the upswing in the first half of this year. Business men at that time were rebuilding stocks that had been depleted in the recession, and they were stockpiling steel in expectation of a steel strike.

But inventories today are low in relation to sales, and most steel stocks are about used up. So producers will be buying steel and other materials at a pretty fast clip.

•

Auto makers in particular will want to replenish their stocks of materials such as steel. Most inventories they built in the first half of the year were in the form of finished goods—new cars now being sold from auto showrooms.

Detroit expects 1960 to be the best auto sales year since record 1955. So auto makers will need heavy inventories to turn out new-model cars.

•

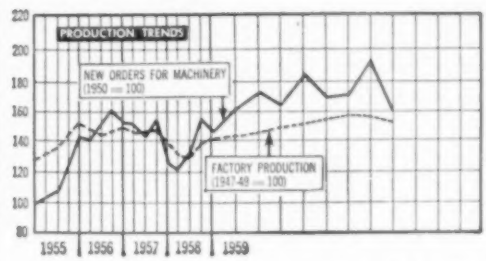
Capital spending plans, too, point to a high level of business activity ahead.

The latest Commerce Department quarterly survey of capital spending plans shows substantial upward revisions. Business spending for new plants and equipment will hit an annual rate of over $35-billion in the last quarter of this year—$5-billion above the corresponding period a year ago.

Spending for plant and equipment this year thus will total over $33-billion. That is almost $3-billion over last year, though still well below the all-time record of $37-billion in 1957. Manufacturing companies alone will spend almost $12.5-billion. That is 9% more than in 1958.

Government figures on corporate sales and earnings for the second quarter of the year explain the pick-up in capital spending.

FACTORY FIGURES OF THE MONTH



Indicator	Aug. 1959[P]	July 1959[r]	Aug. 1958
New Orders for Machinery (exc. elec.)[1]	161.0	193.0	149.0
Contracts for Industrial Construction[2]	165.0	141.0	73.0
Factory Production[3]	152.0	157.0	138.0
Consumers' Prices (cost of living)[4]	125.1	124.9	123.7
Industrial Prices (materials, supplies)[4]	128.4	128.4	126.1
Manufacturing Employment (millions)[5]	16.2	16.4	15.5
Total Employment (millions)[5]	67.2	67.6	65.4
Unemployment (millions)[5]	3.4	3.7	4.7

P = preliminary r = revised

Sources: 1. McGraw-Hill Department of Economics (1950 = 100); 2. Engineering News-Record (1950 = 100); 3. U. S. Federal Reserve Board (1947-49 = 100); 4. U. S. Department of Labor, Bureau of Labor Statistics (1947-49 = 100); 5. U. S. Department of Labor, Bureau of Labor Statistics.

Sales of manufacturing companies, for instance, were almost $14-billion above the same period in 1958.

After-tax profits came close to $5-billion—a new high. Manufacturers, needing more capacity, can use record profits for new plant and equipment.

•

Credit continues to tighten, borrowing costs to rise. The Federal Reserve has again boosted the discount rate on loans to commercial banks.

Higher borrowing costs can discourage spending. Business men who usually finance inventories by borrowing from banks will try to keep stocks at a safe minimum level.

Also consumers will pause before buying big-ticket durable goods on credit. Even so, high personal income and record profits will keep the over-all level of spending high through the first half of 1960.

Ideas of the Month

(For more information, circle item numbers on Reader Service Card next to back cover)

Ten ways to petrify progress is just one of nine chapter headings in "The Embattled Executive" (*AMA*). You'll get a big bang, a clutch of smart ideas, maybe an amusing (?) portrait of yourself as others see you, out of this little book's humorous approach to the serious business of management. **(310)**

No shivering in the shop where "For better unit heating" (*Modine*) hangs on the wall. This check chart tells you what to look for if . . . **(311)**

One look at Anotec—a new anodized aluminum grating (*Klemp*)—will suggest a dozen uses. As sun shades, for instance. Or wall panels, patio screens, grilles, louvers. Gold, blue, pink, green, black, red, etc., etc. **(312)**

Fastener problems? Plastisol nuts (*Stanley*) seal against dirt and liquids, minimize damage and noise from vibration. They consist of free-turning hex nut, cupped lock washer to which sealing material is bonded. **(313)**

New friction-surface conveyor belting (*United States Rubber*) is called "Indestructible Slab," promises long life at low cost. Bright orange. Non-staining surface. Will easily flex around the small pulleys that are standard on package conveyors. In 14 stock widths, from 4 to 48 inches. **(314)**

Handy-dandy fixture (*Ladder Caddy*) hooks onto rung, holds pail on outside of ladder, provides strong third arm on job. **(315)**

All you need to know about portable air tools—in a new handbook (*Rotor*). It's a collection of articles (five of them from FACTORY) designed to show you how to get increased productivity from correct air pressure, better maintenance, and the right tool for the job. **(316)**

Oil-resistant gloves? Sure thing. Oilmacs (*Jomac*) are made of terry cloth treated to prevent the thick loop-pile fabric from absorbing oil. Ideal for handling metal sheets and strip oiled for fabricating. **(317)**

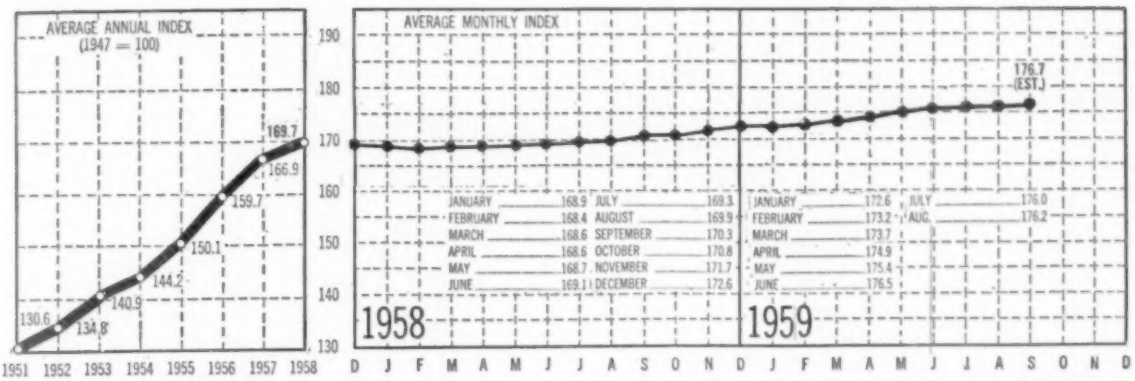
Billed as first truly automatic office copier, the 914 (*Haloid-Xerox*) doubles as short-run duplicator, makes up to 15 copies (up to 9x14 in.) on a single dial setting. Copies all colors—on (this we like) ordinary white or colored paper. Copies are sharp black on white, like printing. **(318)**

Buy or rebuild? It's title of lead article in industrial truck manufacturer's house organ (*Elwell-Parker*). Gives you complete figures covering relative costs of operation and maintenance. **(319)**

More Ideas of the Month on pages 160 and 161

FACTORY . . . PRESS TIME REPORT • OCTOBER 1959

Cost Index of Plant Maintenance



Index Starts New Climb

But during the rest of the year the climb in costs is not likely to be steep.

THE DECLINE in factory maintenance costs, measured by FACTORY's Cost Index, halted after only one month. Costs are beginning to rise again after July's seasonal low. The August index inched up—but not to the June peak. September probably will bring a new high in factory maintenance costs.

Costs inched up 0.2 point in August over July's 176. June at 176.5 held as the all-time peak. But September will probably break the record. The index is now forecast at a level of 176.7 for that month.

Labor costs continued their upward march in August though the steel strike was still far from settlement at that time. When the strike is settled you can expect still another boost in labor costs. Chances are good that the steel wage increase will be a little more than was originally expected in most quarters.

Materials costs over-all averaged slightly higher in August than in July. But cost of maintenance items was still quite a bit below the June level. In August the cost of 7 items declined while only 6 increased. The stability of materials costs during the month was highlighted by the fact that 26 materials cost the same in August as in July.

Because of strong foreign competition and cost savings within domestic companies, prices of several industrial materials have been cut in recent months. This suggests that the cost level can be held fairly steady during the next several months.

	AVERAGE 1958	AUG. (Preliminary)	JULY (Revised)
Building and Facilities Index	**160.8**	**167.1**	**166.5**
Materials	139.2	141.5	141.5
Brick	148.8	153.0	153.2
Elec. fixtures	128.9	127.8	127.8
Elec. switches, boards, fuses	181.5	187.9	187.9
Elec. wire, copper	122.5	135.1	135.1
Glass	152.2	152.0	152.0
Gutters, spouts, ducts	172.9	177.1	177.1
Gypsum products	139.8	140.8	140.8
Heating equipment	127.4	127.6	127.7
Lumber	124.9	137.9	137.5
Millwork	146.9	158.8	157.8
Paint	130.1	130.1	130.1
Pipe, cast iron	170.4	170.4	170.4
Pipe, steel	192.0	189.9	189.9
Pipe & tubing, copper	145.7	144.0	144.7
Roofing	120.4	118.9	118.9
Sanitary fixtures	145.0	156.0	156.0
Sash, metal frame trim	146.9	139.0	139.0
Solder	117.5	123.8	124.1
Steel, structural	231.3	236.3	236.3
Tanks, steel	138.4	136.7	136.7
Valves & fittings	160.6	168.1	167.8
Wire mesh	160.8	162.9	162.9
Labor	175.2	184.1	183.2
Carpenters	160.7	171.1	170.1
Electricians	183.5	192.3	191.8
Painters	181.3	189.1	187.9
Equipment Index	**173.6**	**180.1**	**180.0**
Materials	173.5	176.1	175.7
Abrasives	160.3	161.4	161.4
Alloys, non-ferrous	117.2	123.8	123.5
Bars & plate, steel	223.5	227.1	227.1
Bearings	163.4	164.6	164.6
Belting	150.5	156.8	156.8
Bolts, nuts & screws	229.5	219.4	220.9
Chain	184.0	184.0	184.0
Controls (electric)	181.5	187.9	187.9
Gear-reduction units	181.7	181.7	181.7
Hand tools, mechanics	192.9	198.3	198.3
Lubricants	122.8	125.7	125.7
Motors	147.2	147.1	147.5
Non-ferrous metals	120.9	126.4	127.3
Precision tools	153.2	157.5	157.5
Pumps	184.8	194.8	194.8
Tools, cutting	166.3	177.6	170.0
Valves & fittings	160.6	168.1	167.8
Labor	173.7	182.8	182.1
All mfg. labor	172.2	180.3	180.3
Machine tool labor	175.2	185.3	183.9
FACTORY'S COST INDEX	**169.7**	**176.2**	**176.0**

FACTORY . . . PRESS TIME REPORT • OCTOBER 1959

Looking Ahead in Labor

You won't feel the effects of the new labor reform law for at least a month. But you'd better be ready when they come.

Weapons of the new law are likely to be tested in the courts many times before they stick. Though many provisions are generally known, the law (labeled the Labor-Management Reporting and Disclosure Act of 1959) contains many sleepers.

•

The new law requires:

• **Reports from employers within 90 days of the fiscal year's end.** These must be detailed statements of loans, expenditures, or payments made to union officers, members, or labor consultants that affect the employees' right to organize. (Not included: consultants hired for advice on bargaining or arbitration. Not required: reports where a company officer is assigned to labor matters.)

• **Reports from unions within 90 days, giving fiscal details, including officers' salaries and loans to officers or businesses.** Union officers must report dealings with management that might involve conflict of interest.

• **Effecting the Taft-Hartley curbs in the new bill in 60 days.** From then on, violations of the new ban on secondary boycotts or organizational picketing can become the basis of an unfair labor practices complaint.

•

The sleepers will show up when the law begins operating. How it works will depend on how well it is written and on how enforcement is handled.

There are two reform policemen:

1. The National Labor Relations Board's general counsel. The law doesn't alter his duties—just adds to them.

2. The Secretary of Labor, whose power is both new and strong. When he suspects a violation he can call witnesses, subpoena records, even demand testimony from a reluctant witness by granting him immunity from prosecution.

Will the new law stop labor racketeering? The answer is far in the future.

For one thing, it will depend on the determination of the Secretary of Labor in enforcing the law. Reporting requirements are well spelled out.

As for Taft-Hartley provisions, some of the effects are already clear. Union pressures on employers in organizing drives will ease. The law will cut into union power plays in non-union territory—they can no longer be directed over the heads of the workers to employers.

•

There'll be legal challenges of the new labor law.

If results don't show up pretty clearly, new drives will begin in Congress. Senator John L. McClellan says he'll watch results—especially in transportation. If the returns aren't clear, he'll seek to crack down with the anti-trust laws.

Employer groups are already talking about further legislation to limit union political spending, union security, and the like.

Labor will counter with repeal moves. The AFL-CIO's recent convention pledged the biggest campaign ever to wipe out the 1959 law in 1960.

However the new law fares in practice, the legislative battle won't end. Though the McClellan committee prepared to fold up when the anti-racket legislation went through, the issue of labor reform or union power is here to stay.

•

The effect on Hoffa's Teamsters is the big question.

The Teamsters have been the No. 1 reform target. But their massive power makes it hard to restrain them. Many new rules are directed straight at them —no ex-convict officers, penalties for destroying union records, a "bill of rights" that permits a member to challenge the leadership.

Some of these rules will score. But whether the law will slow the Teamster juggernaut—or its leaders—is a big question.

SEE LABOR RELATIONS NEWS, PAGE 194

Corrugated boxes...
by the mile

Miles of corrugated board
roll off giant H & D corrugators
like this one every hour of
the working day. This production
assures you of prompt delivery
of quality boxes in volume.
Better see H & D.

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For more facts Circle 504 on Reader Service Card

WE WON'T HAVE ANY TROUBLE KEEPING THIS BEARING LUBRICATED— —THANKS TO DISTRIBUTOR DAN THE SKF BEARING MAN

"He recommended a centrally-lubricated spherical bearing," the mechanic told the foreman. "The lube goes directly to the rollers and races—and it flushes the old lube and dirt *away* from the bearing. When it comes to bearings, Distributor Dan sure knows all the answers."

Authorized SKF Distributors can help keep bearings running smoothly, longer, because they offer a complete bearings maintenance service. And they can promptly supply the bearings you need from their large, diversified stocks.

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For more facts Circle 505 on Reader Service Card

FACTORY . . . OPINION

Don't Let This Be Your Problem:

Overcoming "Sit-Back-Itis"

Last month we talked in this space about the importance of attitudes in modernization work. Our point was simple: The man who thinks he knows it all, who won't respond to other people's ideas, is the man who probably needs to modernize the most but is least likely to do so.

We think this is a vitally important point. But we have in mind another aspect of this same general attitude problem that we think has an even more direct personal meaning and urgency for many readers. This aspect of the problem involves your own personal growth and development. We will admit that it's by no means new, but we think it has growing current significance.

The best way to develop the point is to give you an example. It was told to us a couple of weeks ago by a young consultant from the Midwest. He was so concerned about it that he dropped into our offices especially to tell us the story and to urge us to pass it on to you readers. Here it is:

"One of my clients is a small company headed by a man who is an engineering genius, but also a really wonderful salesman. Unfortunately he also has to manufacture the products he invents and sells, and here he has finally reached the conclusion that he is not so hot.

"That's how I got into the act. In looking around for help in the manufacturing area, he hired me as a consultant. In addition to making recommendations as to the control and flow of the manufacturing process itself, I found it necessary to go deep into the manufacturing organization. My conclusion, which I put to him in the form of a recommendation, was that he needed a good man to head up manufacturing—in effect, to be his plant manager.

"He agreed with this recommendation, and we set about finding the man.

"Now here's the real point I want to make. We were shocked by the results of our search for the appropriate man. **We found dozens, literally, who had the qualifications for this job, but very few who had the guts to undertake it.**

"What do I mean by 'guts'? Simply that all but two of the 20 men we finally decided to interview were so concerned about seeking security that we couldn't even get them to talk about opportunity. Our impression, when we were all through, was that there is a general lack of interest in real opportunities to grow and real willingness to undertake important responsibility.

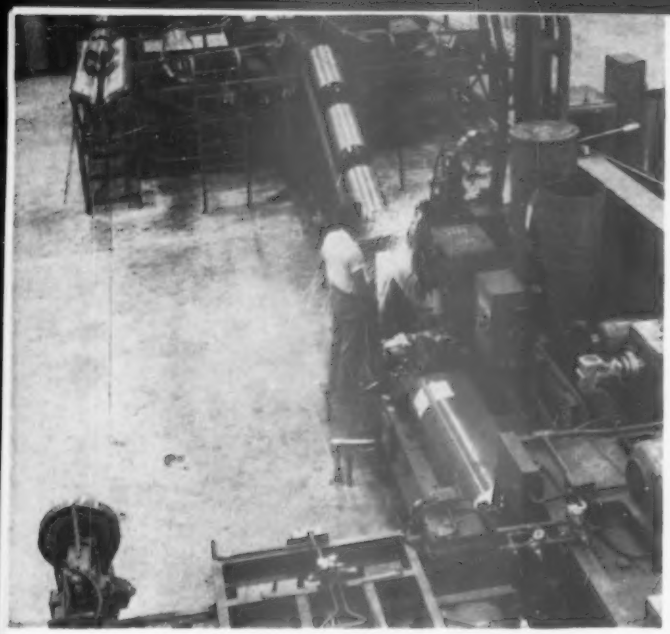
"To put it another way, we reached the conclusion that **all of the men we talked to were very happy to negotiate with us on the rewards for the job, but very few wanted to hear about the challenges.** Very few seemed to want to make decisions or to accept responsibility. To us, this latter was very important because basically, nobody *gives* you responsibility; you have to *accept* it.

"Well, we finally hired a first-rate man—one of the two to whom we offered the job. Though we found we couldn't afford our first choice, we're not disappointed, because the two men were very close in all respects. Both were obviously well qualified technically. But what we liked most about these men was that they were both excited about the job challenge and eager to get at it. Once that idea had got across to them, we didn't have to sell them. They were selling us."

We don't think you have to probe very deep to find the moral in this simple little story. We're certainly not going to insult your intelligence by expanding on it. But we are going to take the risk of being slightly "preachy" by suggesting that it wouldn't be a bad idea to take a look at *your own* attitudes toward responsibility and challenge and opportunity. Perhaps you might want to ask *yourself* the question: "Am I one of these sit-back-and-take-it-easy men who have lost their ability to be enthusiastic, to sell ideas, and to take risks for progress?"

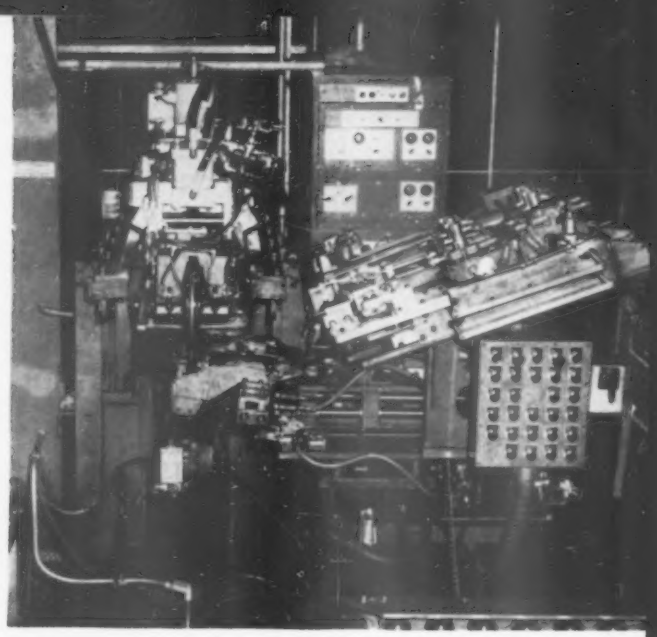
We suspect our consultant friend's concern is strongly influenced by this one experience of his. We'd hate to believe that sit-back-itis is as widespread as he believes because, if it were, we would have a national catastrophe on our hands.

Nonetheless, we know it *can* happen, and we're merely suggesting that it might be in order to make sure that it doesn't happen to you or to other key people in your plant.



To start a $1-million line . . .

It fabricates tanks. It's highly mechanized. It consists of 14 major machines (including two automatic seam welders), two automatic turnovers, and 10 automatic positioners. By planning, Westinghouse changed start-up from a tedious, halt-filled stretch to a smooth, efficient procedure.



with complex equipment like this . . .

Automatic resistance seam welder is just one of many complex units in the line. Static controls direct it through 100 separate motions. For units like this (and the rest of the integrated line) pre-planned design, test, and installation eliminate 75% of typical start-up troubles.

How to Debug Your New Equipment

Best bet: Plan all the way. Do most of it (three phases) before you push the first button. Then take five time- and money-saving steps to full production.

FASTEST, surest way from initial design to first-rate on-the-job performance. That's the top problem of manufacturing engineers when a plant introduces highly mechanized fabricating equipment. Our experience with this at Westinghouse Electric Corporation (Athens, Ga.) leads us to these conclusions:

- **Preplanned debugging** (like the installation and specifications shown above) before the operator throws the switch for the first time will eliminate three-quarters of your start-up troubles.
- **Start-up controls** (page 80) will help you reach production goals in the shortest time.

Preplanning of the Athens plant was in the works for over two years. We had to plan for five miles of conveyors; one of the world's largest continuous-roller hearth annealing furnaces; special coil-winding, cleaning, and painting equipment; a $1-million fabricating line. First salable unit came off the line one day ahead of schedule. Since then, we've met or bettered every monthly schedule. We credit this to our painstaking plans.

By T. J. MURRIN
Superintendent of Factory Planning
Westinghouse Electric Corporation
Athens, Ga.

PREPLANNING PHASES

Preplanning our tank line (only one of several important sections of our highly mechanized distribution transformer plant) involved three key phases:

Phase 1. Design of the system for trouble-free operation and maintenance. Preliminary debugging started back on the equipment design board. (Another debugging problem might have started in the equipment development laboratory.) We verified the practicality of the proposed equipment in terms of engineering and dollars. We preplanned for two major aspects:

- Reliability and standardization of parts, accessibility of components for repair or replacement, preventive maintenance, spare parts, and equipment lubrication.
- Time allowance for tryout and life-testing of new mechanisms. (With another problem, it might be pilot-plant process evaluation.)

For example, the automatic resistance seam welder (photo above) goes through 100 separate motions in welding cooling fins on a typical distribution transformer tank. To insure high reliability in controlling this (and the many other very complicated machines on the tank line), we decided to use static-control devices instead of conventional electromechanical relays. Though first cost was higher, the investment paid off in terms of long-term maintenance-free operation. Reliability is espe-

Installation Specifications—Tank Line

1. Machine description – Two 150-kva., 400-volt, 3-phase resistance seam welders with attached welding control panel, sequence control panel, and magazine feed. Included will be 6 sections of power conveyor, 2 turntables, 2 positioners.

2. General – Welders, positioners, and conveyors will be separate units when received. Crane service will be available in the receiving area only.

3. Size and shipping weight: total, 27 tons.

a. Welders (each): 130 inches long, 100 wide, 96 high; 12,000 pounds.

b. Positioners (each): 126 inches long, 56 wide, 42½ high; 4000 pounds.

c. Conveyors:

(1) North side property #68 or X5905; 72 inches long, 26 wide, 42½ high; 1500 pounds.

(2) East-west conveyor north of property #68 or X5905; 108 inches long, 26 wide, 42½ wide; 2000 pounds.

5. Equipment location:

a. To be located per AA40-3573-1, Machine X5906 and X5907 and/or SR-15, Items 69 and 70.

b. The east-west centerline of the welder and positioner (X5906 or #69) must be in near-perfect alignment: 34 feet, 9 inches, $\pm\frac{1}{16}$ inch north of the centerline of X5905 or SR-15, Item 68. The east-west centerline of the welder and positioner (X5907 or Item 70) must be in near-perfect alignment: 17 feet, $\pm\frac{1}{16}$ inch north of the centerline of X5906 or SR-15, Item 69.

c. North-south centerline of positioners and conveyors must be in near-perfect alignment: 32 feet, 6 inches, $\pm\frac{1}{16}$ inch west of center of Column D.

6. Operations to be performed:

a. All welders, positioners, turntables, and conveyors must be leveled, anchored, and grouted. All shims must be flat and free of burrs and cover at least 75% of surface of bolt pad. After leveling, jack screws are to be backed off.

. . . you must plan debugging down to the last detail.

This Installation Specification covers every unit in the line, every detail of installation and start-up. It tells plant engineers all about incoming equipment—where to unload it, how carefully (and with what techniques) to align it, what sort of electrical, air, and water services it needs. This sample (extracted from a document three times as long) was prepared long before the equipment arrived. The project planning engineer extracted data from a number of sources, then consolidated them into one specification. Time spent at this stage saves valuable labor-hours later on.

and Get a Smooth Start-Up

cially important in debugging highly integrated equipment that performs many different operations during each machine cycle.

We also planned lubrication and spare parts requirements in advance. Why? Because during the hectic start-up period, lubrication needs may not be recognized. So when possible, we included centralized automatic lubrication systems. In any event, we identified each lubrication point, provided data on type and frequency of lubrication.

Many components will fail during start-up. But we've found we can reduce time delays if we obtain a complement of spare parts at the time equipment is installed. An early review with the machine designer should uncover critical or low design-safety-factor components for which spares should be provided.

In the broad sense, preliminary debugging must include a realistic economic analysis of potential savings, return on investment, and the like. This is the underlying justification for the new equipment, and unless the equipment proves to be a sound economic investment, it will never really be "bug-free." In making these economic analyses here at Westinghouse-Athens, we make allowances for extra personnel, scrapped parts, loss of production, and the like during start-up.

Finally we prepare a comprehensive "Equipment Specification" for the equipment supplier. This describes the basic requirements of the equipment (rate of output, productivity required, and the like). It also describes the condition of incoming materials and parts, the required quality level of the finished product, and the guarantee test run that must be made to satisfy final-payment requirements.

Phase 2. Components tested rigorously before being included in the system. Testing of equipment (components and final assemblies) at the supplier's plant is desirable. If duplicate units are to be made, one should be built and tested as early as possible so needed changes or obvious improvements can be incorporated into later units.

For example, the Athens tank-fabricating line includes 10 automatic positioners. They pick up the tank from an adjacent powered roller conveyor, tilt it 90 degrees to horizontal, and move it through radial and longitudinal motions to locate welded parts, punch holes, etc.

While the first positioner was being tested at the supplier's plant, we saw need for certain improvements. For instance, we installed pneumatic cylinders to assist the electric motor drive used to raise and lower the positioners. We changed the tilting mechanism from pneumatic to hydraulic. We added shear pins on the output side of the gear reducers. We simplified the set-up mechanism. And we made many control changes to insure accurate and uniform location of parts. Then we life-tested the sample positioner for several thousand operations without a breakdown. Only then did we settle on final design and begin work on the other nine units.

In testing such equipment, we take care that in-put materials and parts used are representative of those used under normal operating conditions. Products produced should satisfy all quality and performance requirements. Also we select a repre-

Weekly Downtime Summary

#2 Resistance Seam Welder — Tank Line

INCIDENT	CAUSE	CORRECTIVE ACTION	FREQ.	DOWN-TIME
Broken magazine stripper rack.	Slamming of stripper.	Install time delay in return circuit of stripper. Slow stripper down by speed control adjustment. Reinforce rack by design change.	1	6 hrs.
Limit switch No. 16 sticking.	Binding in actuator.	Redesign actuator to eliminate side thrust mechanism.	1	50 min.
Limit switch No. 16 started.	Water in the switch.	Install water-tight switch.	1	40 min.
Broken cylinder connection.	Twisting of tie plate, causing fatigue in the cylinder connection.	Redesign tie plate to eliminate twisting action.	1	80 min.
Broken shear pin.	Positioner lowers too far, hits bottom.	Adjust LS7A to stop positioner sooner.	2	70 min.
Fins not feeding—failing to actuate LS 34.	Fin carriage too tight.	Readjust fin carriage so that fins can actuate LS 34.	1	30 min.

Debugging follow-up is critical. Downtime report (above) and . . .

Machine downtime report is an essential control in speeding tank line toward production goals. For example, weekly data on resistance welder pinpoint the bugs, indicate their severity and frequency, point the way to long-range improvements.

sentative time period for the test run. Its length should be directly proportional, for example, to the anticipated rate of output and the complexity and uniqueness of the equipment to be installed.

The testing phase is ideal for maintenance representatives to get familiar with equipment. The number of bugs encountered during testing will expedite the training of competent maintenance personnel. Time and money invested at this point will be repaid many times over in reducing problems later.

Phase 3. Equipment installed according to preplanned specifications. To handle the installation phase at Athens-Westinghouse we prepared installation specifications on all major equipment. (A typical specification, covering the two tank-line resistance seam welders, is shown above.) This requires careful planning—if it is to be done well within the allotted time and at reasonable cost. Decisions on services, utilities, and special foundations must be made and effected. Decisions are needed on who is to do the work—the equipment supplier's personnel, an outside contractor, or the customer's personnel. Equipment must be carefully received and handled, protected from weathering and damage, and moved to its permanent site. Specific requirements include capable personnel, complete engineering information on weights, special installation requirements, special handling facilities, and a realistic time schedule.

If several machines are to be tied together to form an integrated line, the location of the equipment is much more critical these days than it was in the days of simpler, non-integrated units. Plans must be made accordingly.

Because many different suppliers and contractors may be involved in a large installation, one person should call the shots. Good communications must be maintained—by daily review meetings, if necessary.

Five key steps for start-up

After the three key preplanning phases (design, test, install) are complete, the biggest debugging challenge looms. It's start-up.

Start-up (like designing, testing, and installing) requires detailed planning. But now we must add both engineering and practical operating know-how. Formal try-out orders, which spell out the sequence and aims of start-up, should be issued. One qualified person should be placed in charge. At Athens-Westinghouse it's the manufacturing engineer who has handled the project right from the beginning.

Start-up procedure and control follows five logical steps. (In practice, there must be some flexibility and some overlap in moving from one step to another.) For us it went something like this:

Step 1—Operate manually. This is to make sure that mechanical motions are free. For instance, the manufacturing engineer operated the resistance seam welders on "manual" controls for several days. He checked clearances, adjusted speed control valves, moved limit switches, made other minor alterations.

Step 2—Operate automatically. Purpose here, with manufacturing engineer still handling the machine,

Tabulation of Weekly Tank Line Defects

LOCATION AND NUMBER OF DEFECTS ON TANK	PROCESS AREA WHERE FOUND				
	Zyglo Test	Paint Line and Tank Loading to Assembly	Assembly	Crate Section	Totals
Longitudinal Seamer	Welds 28	Gasket Seat 8	6 Split Welds		42
Bead and Flange					
Filling Pads			1 Bad Weld 1 No Threads		2
Arrester Pads	21		7 Out of Line	4 Missing 1 Out of Line	33
Lifting Hooks	3	1 Missing			4
Fins	16				16
Internal Ground Studs			2 Location 2 Missing		4
Bolt-in Brackets					
Hanger Lugs	17				17
Double Seamer					
Punch Press		2	1 Location Out of Round		3
Other		1 Rusty	10	1 Leak 23 Cannot Palletize	35
Number Found Defective	85	12	30	29	156
Number Tested	1706	1293	1170	1099	52.68
% Defective of Number Tested — 6-Wk. Aug.	5.1	Not Available	2.32	0.66	2.99
% Defective of Number Tested — This Week	4.98	0.92	2.56	2.64	2.98

. . product quality record (above) tells what's wrong, what's needed.

Product quality record shows where, among the various inspection points, a flaw is found on the product (left-hand column). Engineers use this weekly summary in conjunction with downtime report for programing debugging action.

is to debug controls. For instance, we had to alter some sequences so that the powered conveyor-positioner-welder combination worked well on an integrated basis.

Step 3—Break in operators. At this point full-time operators start to take over running the machines—even though many bugs still remain.

Step 4—Accelerate equipment. Now, for the first time, we turn our attention to cycle time and productivity goals. Maintenance personnel, trained earlier in troubleshooting, are invaluable at this step.

Step 5—Set up controls. This period requires careful records on out-put, number of operators required, quality of product, machine breakdowns, maintenance costs, use of spare parts, lubrication, and the like. This information—with careful analysis and sound judgment—must be considered along with production demands to program in detail the necessary and continuing debugging work. Specific responsibilities must be defined. The work to be done must be scheduled and assigned to the equipment supplier or to people in manufacturing, engineering, maintenance, operations, etc.

At Athens-Westinghouse we kept detailed weekly reports on machine breakdowns (above, left) during start-up. Such summarized data pinpointed the machine components that caused breakdowns and required improvement. We kept this downtime record for about a year.

Meanwhile the quality control department prepared and distributed a weekly report covering tank line defects (above, right). This not only assured us of a high-quality product by spotlighting serious defects, but also supplied invaluable information to guide necessary corrective work on the equipment.

THREE MORE GUIDES

If the debugging period is sucessfully completed, a properly operating machine should be the result. Its performance should satisfy the goals for which it was planned: increased capacity, improved quality, reduced costs, shorter lead times, improved safety.

Although it's hard to generalize about debugging, these three conclusions may be worth while:

- No new highly mechanized manufacturing equipment will work just the way you've planned it immediately after it's installed. Length and cost of the start-up period will vary directly with the uniqueness and complexity of the equipment. Time will range from two weeks to two years or more; cost, from 5 to 100% or more of the original equipment costs. Time and cost will vary inversely with the amount of planning put into the design, test, and installation stages.
- Plant management (and others) must not become discouraged during debugging—or too hasty in evaluating equipment performance. It's better to determine realistic ground rules in advance covering primary objectives, return on investment, time schedules, and the like. You must anticipate debugging costs to insure a realistic economic analysis—even though you may not estimate these costs very accurately.
- Successful debugging of highly mechanized manufacturing equipment requires the cooperation and contributions of many functions—from top management all the way down to the machine operator. If you can't get the entire organization's support, you shouldn't undertake major projects involving a lot of money and complex challenges.

Whether your plant is big or small, it needs this...

20-Point Plant Safety Program to

Maintenance workers face more hazards than most others. But they don't necessarily have to have more accidents—if you use a plan like this one.

AUTHOR Bill Meier is one of the growing number of maintenance management men who are rebelling against the old idea that maintenance departments are doomed to higher-than-average accident rates. He admits the hazards are usually greater than average, but says that this just means accident prevention work must also be better than average.

His advice: Don't sit back and rely on a company-wide safety program. It may be fine for production and other key plant functions, but a fizzle for maintenance. What's needed is a special program, carefully designed to fit maintenance requirements.

Meier cites his own company's experience to make his point. In 1951 Parke, Davis had a maintenance department frequency rate of 19.6 (accidents per million man-hours of exposure). This was several times the rate for the rest of the plant. The next year the company adopted the 20-point plan described in this article. The result today, seven years later, is a frequency rate of 6.5—an improvement of 67%. Severity rate (days lost per million man-hours) has dropped by 79%. That's real progress, especially when you consider the company has been growing during this period.

The Parke, Davis maintenance department is a big one (360 employees) in comparison with most plants. But, neither Meier nor FACTORY's editors consider his 20-point plan a "big-company-only" tool. The plant with 15 to 20 craftsmen in its maintenance department can use it, with only minor modifications, as readily as the plant that employs 1500 to 2000 men.

Making this kind of program work is no one-man job. The secret is a concentrated local program in which all key men get deeply involved. Meier points out that the success of his program has depended on the dedication of Parke, Davis' engineering managers (J. M. Abate, safety coordinator, engineering division; H. W. Chandler, manager of maintenance shops; M. M. Gingrich, assistant superintendent, plant services; V. Vaclavik, manager, area engineering).

Meier also advises that the 20 points in the program are not magic figures. The major parts just add up that way. You will probably be able to identify many minor, yet important, elements from your own experience that will supplement these points. In short, no technique that cuts accidents should be overlooked.

1. Name a co-ordinator

First step in setting up a formal divisional safety plan was to fix the responsibility for safety in the hands of one man. We still agree the first-line supervisor is always responsible for safety. But if he's new in his field, as many of our foremen were in 1952, he needs an assist from an expert on the subject.

We therefore appointed a safety coordinator from the division ranks. His first assignment was to bring himself up to date on the whole broad subject of industrial safety. He attended various safety conferences, became an active member of safety associations, built up a reference and film library—all in a concentrated effort to equip himself better to train the supervisors of the engineering division.

Duties of the safety coordinator as spelled out in his job description, include these: conduct quarterly safety meetings, interview accident-prone workers, conduct a safety-leader program, review all accidents, compute safety ratings, make awards, counsel with foremen, conduct foreman safety training, and maintain displays of safety data on shop safety bulletin boards. We'll expand on these activities as we progress.

By WILLIAM G. MEIER,
Assistant Director of Engineering
Parke, Davis & Company, Detroit

Cut Maintenance Accidents

2. Name a shop safety leader

Safety can't be imposed. It requires participation. Our plan was to set up an organization that would involve participation from everyone. The entire subject of safety was discussed with the union. As a result the safety coordinator appointed a safety leader for each shop from the hourly ranks, on the recommendations of the shop foremen. The safety leader serves for a period of six months, during which time his name is displayed on the safety bulletin board in his shop. Each leader wears a special badge.

The safety coordinator holds regular meetings with safety leaders, stressing their duties and authority, answering questions on safety problems. We've found the safety leader is most helpful in training and in maintaining the interest and participation of our hourly men at a high level.

3. Seek union cooperation

In all our efforts to sell safety, union officials have been most cooperative. They've helped us select shop safety leaders, and they've introduced safety at membership and stewards' meetings. As an example of their cooperation our safety co-ordinator was recently invited to address the monthly officers' and stewards' meeting in the union hall.

We soon realized that the foremen-steward meetings also presented a real opportunity to discuss safety problems in an objective way. They were designed originally to develop harmony between union and management by listing the causes of grievances before they became grievances. Since our mutual aim is to make each craftsman a safe worker, a portion of each of these give-and-take meetings is devoted to safety. As a result, instances have come to light showing where the workmen felt the union was not as interested as it might be in safety. Occasionally, of course, the union has cited some lack of worker interest.

These meetings have been an excellent means of clearing the air on many touchy safety problems. For example, it was in these meetings that most of the problems in enforcement of the wearing of saftey glasses on the job were ironed out.

4. Hold regular meetings

We found that the most effective presentation by a foreman is made to a small group in his office or on the job. So we've discarded the program that featured only one formal safety talk each month in favor of one that stresses continuous attention to safety.

We plan an agenda guaranteeing that safety will be discussed by the foreman with each man at least once a month. Depending on the foreman and his capabilities, this may be a meeting with the entire shop, or with three or four men in the shop office, or even a five-minute talk at the job site.

As a further assist to the foreman, we help him plan his safety meetings. At each monthly foremen's meeting we alert him to the safety topic for the month and present and discuss appropriate minutes of top-management safety meetings.

As a back-up to this monthly shop safety meeting, each hourly employee (also each line supervisor) attends quarterly safety meetings conducted by the safety coordinator. These meetings often feature guest speakers, who sometimes use entertaining and unique media to convey their safety message. On one occasion we even had magic and hypnotism. Such meetings are another means of periodically reminding the craftsman that he must never let safety out of his mind.

Turn the page

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5. Train safety talkers

One of the hardest parts of a safety program is presenting it to workers. This becomes even harder if the program is not set up to assist and train the front-line supervisor in selling safety.

The role of the supervisor in the program must be defined at the start, and he must be sold on it. But being sold and selling are two different things. This became apparent when we asked each central and area-shop foreman to hold to a minimum of one five-minute safety talk with his workmen each month. Theoretically, this was good. But although a foreman is a skilled craftsman and a good leader, he's not necessarily a good salesman. Often he has trouble talking to a group on any subject outside his own trade.

Attempting to make finished speakers or safety salesmen of the foremen would have been difficult. But we did feel that the foremen could be taught the fundamentals of presenting information to a group. So our education department conducted a series of meetings on counseling and conference leadership. These meetings were augmented with films obtained by our engineering library. Through our safety co-ordinator we are advised of conferences and meetings on safety to which we send our first-line supervisors.

6. Train men to fight fire

No safety program is complete unless it gives adequate attention to the dangers of fire. Our program features portable fire-extinguisher training for all craftsmen and off-shift workers. Since these employees work in all sections of the plant, often on lone assignments, we keep them well versed in the use of all types of portable extinguishers.

7. Use area engineers

Our area engineer plays a key role in providing our central maintenance groups with information on all operations throughout the plant. He provides such services as proper engineering design recommendations, craft and production co-ordination, and supervisory assistance during job execution. Therefore each area engineer is in a position, from start to finish of each job, to keep maintenance safety objectives in mind, thus insuring plant-wide surveillance.

Our area organization also promotes willingness in each worker to practice safety around the clock. Our craftsmen permanently assigned to the various areas are mostly volunteers. Thus a craftsman is working where he likes to work. Being permanently assigned, he soon becomes completely familiar with the special hazards of the work in his area.

Area craftsmen maintain close contact with production supervisors and at times attend production safety meetings. They also develop a close working relationship with their area engineer. As a result there's always an opportunity to make each craftsman receptive to new and safer ways of doing his work. Moreover, each area craftsman takes part in all the safety activities of his central shop.

8. Spot accident-prone workers

Early in the program it became apparent that 25% of our employees were responsible for approximately 75% of our accidents. We began to conduct personal interviews with these employees to discover their basic problem—and to impress upon them the fact that safety is an important part of good job performance.

These interviews are held with the employee in the office of the safety co-ordinator, with his foreman and safety leader in attendance. They are most effective. For example, one of our recent interviews was with an employee who had averaged three injuries a month for five consecutive months. Since his interview, four months ago, he has not had one injury.

9. Instruct contractors

During the past year we have made an all-out effort to assure ourselves that our company's safety practices are understood by every contractor's employee assigned to work on our property.

A 15-point checklist covering every possible activity is thoroughly reviewed with the superintendent of the contracting company by our engineer assigned to the job and our engineering safety coordinator. Our engineer and the contractor's representative sign the form stating that they fully understand their responsibilities. To help the contractor's representative educate his men, we supply him with enough copies of the "Parke, Davis Fire Prevention and Safety Regulations" to distribute to each of his men.

Regulations are printed on a 3¼x4½-in. white plastic card—easy to carry in a worker's pocket. The card carries 11 specific instructions pointed to rules on permits, out-of-bounds areas for powered trucks, smoking, use of goggles, use of barricades and signs, good housekeeping and construction precautions.

10. Stir up competition

Friendly competition always encourages extra effort. Realizing this, we have instituted the Engineering Division Safety Award Plaques.

To establish a fair and sound basis for these two awards, we assigned individual "hazard ratings" to each of our 19 shops, based on past experience and statistics. The shops with the higher hazard ratings are placed in one group to compete for the "A" Award plaque. Those with lower hazard ratings compete for the "B" Award plaque.

These awards are made on a quarterly basis and are presented by the safety coordinator with the department manager, superintendent, and plant safety engineer in attendance. After five years the two shops that have won the awards most often will be allowed to keep them. Then we will create new awards.

11. Train in-plant drivers

The power truck operator gets a special training course. Classroom sessions and driving instruction cover general driving problems, safe floor loadings, and the care and maintenance of equipment.

12. Inspect tools, equipment

Tools and equipment are accident hazards unless kept in perfect working condition. Each tool, including manual equipment, chain and electrical hoists, electrical tools, and so on, is listed on a McBee "Keysort" card. Using these cards as a guide, our preventive maintenance section schedules its work so each piece of equipment receives a periodic safety check.

All ladders receive special attention. The carpenter shop inspects them regularly each month and makes only minor repairs. Any ladder, regardless of size or type, is automatically scrapped when it shows signs of needing repairs.

13. Reward safe drivers

Our motor transport division is part of the engineering function. Safety in this area must extend outside the physical plant layout.

As an incentive to our drivers to exercise care and discretion in handling vehicles, merchandise, and equipment, we have established a safe driver's bonus award. Over the years this award has promoted care and caution among our drivers.

They regularly attend special safety meetings conducted by officers from the traffic safety division of the Detroit police department. We are sure these meetings have taught drivers not only to do the right thing in traffic, but the courteous thing as well. They know that to the motorist driving beside them they represent "Mr. Parke, Davis." Their safe driving habits show that we care about our neighbors.

14. Investigate all accidents

Another means of selling safety is the accident investigation by the foreman. The safety coordinator notifies him of each accident so he can make an immediate investigation and initiate any corrective action that appears necessary.

Our program is geared to make the foreman the controlling medium for safety in his shop. We do everything possible to help him convince his workmen that the easiest way to work is the safe way.

15. Report accidents monthly

Human nature being what it is, we lose interest in any planned program that continues too long without fresh incentive. This, of course, must not happen when safety is involved. Lack of enthusiasm can lead to carelessness, and carelessness with respect to safety can easily lead to a major fatality.

Our engineering supervisors are aware of this tendency, and are constantly inventing new ways and means to create and maintain an awareness of safety. During the past few years we have inaugurated a number of safety innovations that have come a long way toward achieving our basic objective.

One of these is a monthly engineering report. In effect, it's an accident-frequency report. It lists the shop concerned, name of employee, occurrence date, brief description of the injury, and amount of lost time, if any. The names of shops having a perfect record appear at the bottom of the report.

16. Probe serious incidents

Whenever a serious or potentially serious accident occurs, the safety coordinator issues a full fact-finding report on it. The report follows a meeting with all the parties concerned. It covers details of the investigation, corrective action indicated, and procedures that should be followed to prevent any possible recurrence of the incident in the future.

Turn the page

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17. Report lost time monthly

Our monthly lost-time accident report covers severity of accidents. It lists all shops, number of days since the most recent lost-time accident in each shop, and each shop's previous record. It includes a special safety message. Each foreman gets a copy to post on his shop safety bulletin board.

18. Set up hazard procedures

Some jobs require such complicated safety measures that they need a special procedure. In this category is any job requiring cutting or welding, or use of impact tools likely to produce sparks.

For every cutting or welding job our fire-prevention officer (or his designee) issues a formal "Cutting and Welding Permit" on request from the foreman. It requires the counter-signature of the area engineer, department manager, fire-protection officer, foreman, and safety engineer. These men attest to proper preparation of the area for any work that may produce flame, sparks, or high temperature.

Such permits are also issued when drilling, chipping, or hammering is to be done in a hazardous area. These permits list the date, building, floor, department, work to be done, time started and completed, and names of persons performing the work. Back of the permit lists several safety reminders.

19. Set up shutdown rules

We have a rigid permit procedure whenever we make a major shutdown of a service facility. This shutdown permit serves a dual purpose: First, it helps prevent production losses or damage to material and equipment. Second, it warns people that certain safety devices will not be operational if controlled by the service to be shut down.

The procedure requires that the manager of the maintenance shops or the superintendent of maintenance send a "Shutdown Notice" to each department manager and superintendent concerned, via the area engineer. Each of these supervisors must return an acknowledgment of the shutdown to the maintenance department. The permit is issued only after all signed acknowledgments have been returned. It lists time and date of shutdown, facility to be shut down, and the job requiring it. Finally, the permit must be approved by the manager of the maintenance shops.

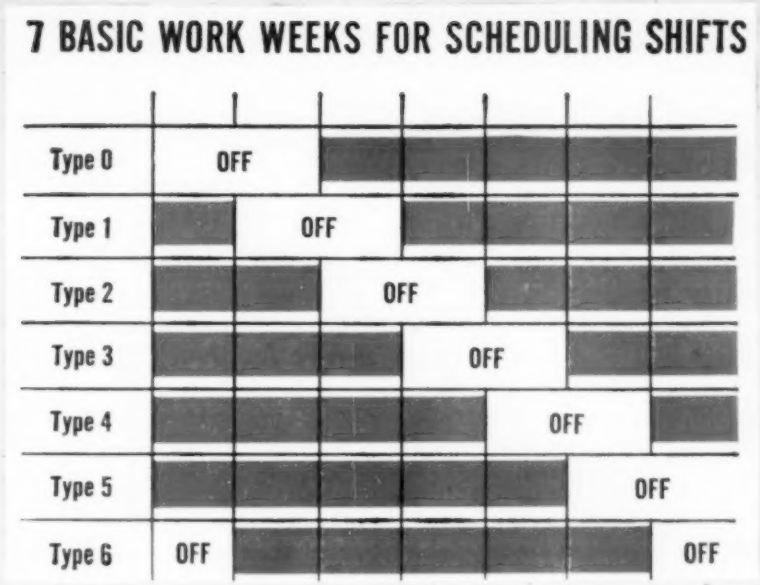
20. Build safety into planning

Physical hazards can and should be guarded. But sooner or later an unsafe worker will ignore the precautions and suffer an injury or cause an accident. Much of our maintenance must be done without equipment guards. Our jobs are not repetitive, which means that each one presents new and different hazards. For this reason we stress the importance of safety precautions at the job site.

Each central and area-shop foreman reviews each job to determine if all special safety installations or equipment needed are listed on the work order. Even the request for a work order is imprinted diagonally across its face with the challenge: Has It Been Checked for Safety?" For example, a job might require explosion-proof or non-sparking tools, respirators, or protective clothing. Or it might pose a problem of protecting passers-by with barricades.

Some shops (lubrication, for example) have "built-in" reminders at the head of job cards. These messages warn of hazardous areas, show when a pass is needed, and instruct in the disposal of contaminated material. All such comments on hazardous conditions or safety precautions are highlighted in red.

Coming in November—FACTORY's "Modernization Case Book." A special issue that will bring you over 500 plant-tested ideas for updating your plant, equipment, and methods.



Here's a quick, sure way to schedule workers. It will save you time, toil, and many a headache. It's a snap to apply. And it means . . .

Shift Scheduling Made Easy

SHIFT SCHEDULING a headache? Then here (and on the following pages) is a new way to cure the pain—quickly, efficiently, and at minimum overtime cost. Key to the plan is the chart of seven basic work weeks pictured above. You'll see how it's used as you read on.

With this key and a few "Rules of Thumb" (page 88), you can iron out shift scheduling problems in plant protection, machine operations, continuous processing, maintenance, and just about any other activity for which you must schedule people for more than one shift per day on a seven-day schedule.

What's more, you'll be able to create shift schedules that will do these things for you:

- Economically distribute man-hours to do the work.
- Promote employee morale and efficiency by providing balanced work and rest periods.
- Keep crippling overtime at rock bottom.

And you'll go a long way toward improving employee relations, because these schedules will . . .

- Provide equal treatment for employees of each group or occupation in work days, days off, and shifts.
- Eliminate changing shifts in the middle of the work period. (Eight hours or less between the end of one shift and the beginning of the next is bad.)
- Avoid the practice of forcing a man into off periods of less than two days. (The split day off is bad.)
- Minimize disruption of family and other off-the-job activities among employees.

Before plunging into the mechanics of seven-day scheduling, you should understand a few basic facts about the chart above.

There are many different ways to schedule as few as three men on three shifts during a single week. Suffice it to say, though, if you accept the need for consecutive days off as a desirable principle (and it is), then only seven basic work weeks are possible. They're the ones you see above.

These seven basic work weeks are easy to remember. Keep them in mind as we develop the shift-scheduling concept through the remainder of this article. (To help you do this, each following two-page spread of this article has a small reproduction of the 7 Basic Work Weeks in the upper left corner.) This chart will be your guide whatever kind of plant you have. It will guide you in scheduling plant operations in which you must rotate shifts and number of men per shift (Symmetrical Shift Scheduling, page 88). And in scheduling continuous-process operations, in which you also rotate shifts but need the same number of men on every shift (Even Distribution Scheduling, page 89).

But before you turn the page, note the pattern of the chart above. It shows a seven-day work week beginning on Monday and running through Sunday. Type O has no work days at the beginning of the week; Type 1 begins the week with one work day; Type 2, with two work days; and so on through Type 5. Type 6 differs. It has "split" days off. But because these days occur at the beginning and end of the week, we can schedule consecutive days off if we put Type 6 in proper sequence with preceding and succeeding weeks.

Now, to see how the system is developed—and how you can apply it to problems like yours . . .

Turn the page

By WILLIAM C. HEALY
Quality Control Engineer
John Oster Manufacturing Company
Milwaukee, Wis.

Begins on page 87

Whether your problem is uneven shifts or even, round-the-clock shifts, here's an easier, faster answer for you.

7 Basic Work Weeks for Scheduling

	M	T	W	T	F	S	S
Type 0	OFF	OFF					
Type 1		OFF	OFF				
Type 2			OFF	OFF			
Type 3				OFF	OFF		
Type 4					OFF	OFF	
Type 5						OFF	OFF
Type 6	OFF						OFF

6 Rules for Shift Scheduling

These rules of thumb give you a quick and convenient system for working out shift schedules without resorting to a schedule sheet.

1. In any work week sequence, if the second work week type is the same as the first, the resulting initial work period will always be 5 days, followed by two off days. This rule holds for all 7 types of work weeks, as long as the work week is continuously repeated.

2. For any sequence of work weeks 0 through 5, of the second work week type has a higher number than the first week, the resulting first complete work period will exceed 5 days by the amount of the difference. Always two days off following the work period. (Sequence 2-3 is an example. Its resulting work period is 6 days.)

3. For any sequence of work week types 0 through 5, if the second work week type has a lower number than the first week, the resulting first complete work period will be less than 5 days by the amount of the difference. Always two days off following the work period. (Sequence 4-3 is an example. Resulting work period is 4 days.)

4. Work Week 6 always stands by itself as a separate work period of 5 days, unrelated to the weeks following or preceding it. Always 2 days off following the work period. (Examples are sequences 4-6 and 6-5.)

5. Work Week 6 in a non-repetitive sequence such as 4-6,6-5,5-6, will give a single day off, unless it is preceded by Work Week 5 or followed by Work Week 0, in which case the result will be 3 days off.

6. When Work Week 0 is preceded by Work Week 5, the result will be a 4-day off period.

These 7 basic work weeks . . . used with these 6 rules of thumb . . .

How You Can Schedule Uneven Shifts

Mathematically speaking, 127 combinations of the seven basic work weeks are possible. But practically speaking, only 50 really are usable. That is, only 50 give reasonably even coverage of the shifts and at the same time meet requirements for employee satisfaction and fairness. The 50 Best Combinations are shown in the table on the facing page.

All 50, when correctly organized (as explained later in this article), can be applied to operations requiring the same number of workers, of the same type, on every shift around the clock. We will later refer to this style of scheduling as Even Distribution Scheduling. Of course, all 50 can also be used for any single-shift, repeating schedule.

But we can use only 18 of the 50 Best for schedules in which men of differing work function must rotate shifts (day, afternoon, night) and work weeks or where a different number of men is required on each shift. These 18 are marked with a "Yes" in Column 2 of the chart. Of the 50, these 18 are the only ones suited to Symmetrical Shift Scheduling.

We can derive a few "Rules of Thumb" (above) about these 50 work-week combinations. With the rules on hand we can determine what the effect will be of any combination or sequence without resorting to tedious trial and error procedures.

For example, consider Rule 2. Using it, we can quickly compute the four-week repeating sequence of work-week types, 2-4-5-0. Here's how: Since the second work-week type (Type 4) exceeds the first by 2, the first complete work period of the schedule is 5 plus 2. So it's 7 days long.

Now take any one worker and see how this work-week sequence will schedule him. His sequence starts with Type 2 work week. Applying Rule 2 and Rule 5 to his sequence we get the result: 7 days' work, 2 days off; 6 days' work, 4 days off; 7 days' work, 2 days off—for 4 weeks. Then the cycle is repeated to complete the desired number of weeks in our schedule.

FIRST, A SIMPLE PROBLEM

Here's how the system works on a simple shift-scheduling problem.

A jet-engine assembly plant requires one guard at the plant gate every afternoon and night, seven days a week. No guard is required during the day.

Shift total comes to 14 (7 afternoon, 7 night).

50 BEST FIVE-DAY WORK-WEEK COMBINATIONS

Types of Weeks in Combinations	Useful for Symmetrical Scheduling	Number of Shifts Produced by Combination						
		M	T	W	T	F	S	S
2-WEEK COMBINATIONS (2 groups or 2 individuals)								
1-3		2	1	1	1	1	2	2
1-4		2	1	1	2	1	1	2
1-5		2	1	1	2	2	1	1
1-6		1	1	1	2	2	2	1
2-0		1	1	1	1	2	2	2
2-4		2	2	1	1	1	1	2
2-5		2	2	1	1	2	1	1
2-6		1	2	1	1	2	2	1
3-0		1	1	2	1	1	2	2
3-5		2	2	2	1	1	1	1
3-6		1	2	2	1	1	2	1
4-0		1	1	2	2	1	1	2
4-6		1	2	2	2	1	1	1
5-0		1	1	2	2	2	1	1
3-WEEK COMBINATIONS (3 groups or 3 individuals)								
1-3-5		3	2	2	2	2	2	2
1-3-6		2	2	2	2	2	3	2
1-4-6		2	2	2	3	2	2	2
2-4-6		2	3	2	2	2	2	2
2-4-0		2	2	2	2	2	2	3
2-5-0	YES	2	2	2	2	3	2	2
3-5-0	YES	2	2	3	2	2	2	2
4-WEEK COMBINATIONS (4 groups or 4 individuals)								
1-2-4-6		3	3	2	3	3	3	3
1-3-4-6		3	3	3	3	2	3	3
1-3-5-0	YES	3	2	3	3	3	3	3
1-3-5-6		3	3	3	3	3	3	2
2-3-5-0	YES	3	3	3	2	3	3	3
2-4-5-0	YES	3	3	3	3	3	2	3
2-4-6-0		2	3	3	3	3	3	3

Types of Weeks in Combinations	Useful for Symmetrical Scheduling	Number of Shifts Produced by Combination						
		M	T	W	T	F	S	S
5-WEEK COMBINATIONS (5 groups or 5 individuals)								
1-2-3-4-6		4	4	3	3	3	4	4
1-2-3-5-6		4	4	3	3	4	4	3
1-2-3-5-0	YES	4	3	3	3	4	4	4
1-2-3-5-6		4	4	3	4	4	3	3
1-2-4-5-0	YES	4	3	3	4	4	3	4
1-2-4-6-0		3	3	3	4	4	4	4
1-3-4-5-6		4	4	4	4	3	3	3
1-3-4-5-0	YES	4	3	4	4	3	3	4
1-3-4-6-0		3	3	4	4	3	4	4
1-3-5-6-0	YES	3	3	4	4	4	4	3
2-3-4-5-0	YES	4	4	4	3	3	3	4
2-3-4-6-0		3	4	4	3	3	4	4
2-3-5-6-0	YES	3	4	4	3	4	4	3
2-4-5-6-0	YES	3	4	4	4	4	3	3
6-WEEK COMBINATIONS (6 groups or 6 individuals)								
1-2-3-4-5-6		5	5	4	4	4	4	4
1-2-3-4-5-0	YES	5	4	4	4	4	4	5
1-2-3-4-6-0		4	4	4	4	4	5	5
1-2-3-5-6-0	YES	4	4	4	4	5	5	4
1-2-4-5-6-0	YES	4	4	4	5	5	4	4
1-3-4-5-6-0	YES	4	4	5	5	4	4	4
2-3-4-5-6-0	YES	4	5	5	4	4	4	4
7-WEEK COMBINATIONS (7 groups or 7 individuals)								
1-2-3-4-5-6-0	YES	5	5	5	5	5	5	5

yield the week combinations that make shift scheduling quick and easy.

Manpower requirement adds up to 3 employees.

At quick glance, the scheduling boss estimates that three employees working a 5-day, 40-hour week will supply a total of 15 shifts. That's one more than the required 14. But that one extra shift is better than hiring only two men and making up the deficiency (of 4 shifts) in overtime.

The scheduling boss turns to the second column of the "50 Best" chart. He finds only two combinations of three work weeks that are satisfactory for symmetrical scheduling. He selects the combination 3-5-0. For the first week of the three-week schedule he puts one man (Allan) on Type 3 week, another (Brown) on Type 5, and another (Case) on Type 0. In the second week Allan gets Type 5, Brown gets Type 0, and Case gets Type 3. From week to week they alternate afternoon and night shifts. The table below shows how the three-week schedule will look (A = afternoon, N = night):

Name	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S
Allan	N	N	N			A	A	A	A	A	A	A					N	N	N	N	N
Brown	A	A	A	A	A					N	N	N	N	N	N	N	N			A	A
Case			N	N	N	N	N	N	N	N			A	A	A	A	A	A	A		
Total men on:																					
A-shift	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
N-shift	1	1	2	1	1	1	1	1	1	2	1	1	1	1	1	1	2	1	1	1	1

The scheduling boss sees that with this work-week combination the manning requirement and the extra shift on Wednesday night will always remain the same.

Cross-checking with the rules, the boss observes that Allan's first full work period (work-week sequence, 3-5-0) is 7 days (Rule 2), Brown's first work period (work-week sequence, 5-0-3) is 5 days (Rule 3), and Case's first full work period (work-week sequence, 0-3-5) is 8 days (Rule 2). But note that all men work only a 40-hour calendar week, which starts on Monday. So, no premium pay for extra work days.

NOW, A TOUGHER PROBLEM

Now, with the foundations just established and the charts above for reference, let's test this shift scheduling system in a complex problem.

Missile components Production Manager Steve Martin faces an unusual situation. A new tape-controlled computing machine has cost the company more than any other machine in the plant. To pay off, it must operate as much as possible. But it is such a complex mass of circuitry that it can't be used safely for more than two eight-hour shifts each day. The remaining shift is needed for maintenance.

Three trained men are needed to operate the giant machine on each of the two shifts it works. In addition,

SHIFT SCHEDULING MADE EASY

Begins on page 87

7 Basic Work Weeks for Scheduling

	M	T	W	T	F	S	S
Type 0	OFF	OFF					
Type 1		OFF	OFF				
Type 2			OFF	OFF			
Type 3				OFF	OFF		
Type 4					OFF	OFF	
Type 5						OFF	OFF
Type 6	OFF						OFF

three skilled electricians are required on the maintenance shift. Also, Martin decides, since one crew depends on the other for aid, one operator should stand by to advise the electricians during the maintenance shift, and one electrician should be on hand to cope with emergencies during the first of the two operational shifts. Regular maintenance is slated for the day shift.

Martin sums up his manning requirement like this: 1 operator on the day shift, 3 on the afternoon shift, 3 on the night shift—every day, seven days a week.

Considering his electricians separately, Martin sees his manning requirement this way: day shift, 3 electricians; afternoon shift, 1. The schedule runs every day, seven days a week.

The facts to start with—Martin realizes he must solve his scheduling problem efficiently, economically, and as fairly as possible. By equalizing scheduled work days and off days and by evenly distributing day, afternoon, and night shifts, he can keep overtime pay at rock bottom.

Martin's first step is to analyze the situation in simple mathematical terms. He sees his shift requirements this way: operators, 49 per week, or the rough equivalent of 10 men; electricians, 28 per week, or roughly 6 men. All will work the basic 5-day week. This leaves one extra operator shift per week and two extra electrician shifts per week. Martin considers the requirements of each group separately.

Operators first—A brief but careful check of the "50 Best Work Weeks" indicates that the 7-week combination, 1-2-3-4-5-6-0, will yield exactly 5 manshifts each day—a total of 35 shifts.

Now Martin puts seven operators in this sequence. This leaves three of them without assignment. Another fast check of the "50 Best" reveals that the 3-week combination 2-5-0 will give Martin the additional two shifts per day he needs. He joins this combination with the first 7-week combination to make a master sequence, 1-2-3-4-5-6-0-2-5-0—a total of 50 shifts, which is one more shift than he needs.

Next, to this master plan Martin assigns day, afternoon, and night shifts, trying the first time to make the distribution as close as possible to the final result desired for best scheduling.

You'll see just below how he gets a total of 7 day shifts, 20 afternoon, and 23 night. That's close to his 7, 21, 21 goal. Yet he knows that for efficiency, economy, and fairness he must get even closer.

Type of Work Week	M	T	W	T	F	S	S	
1	N			A	A	A	A	
2	A	A			N	N	N	
3	N	N	N			A	A	
4	A	A	A	A			N	
5	N	N	N	N	N			
6		N	N	N	N	N		
0			D	D	D	D	D	
2	D	D			A	A	A	
5	A	A	A	A	A			
0			N	N	N	N	N	
Shift: Day	1	1	1	1	1	1	1	7
Shift: Afternoon	3	3	2	3	3	3	3	20
Shift: Night	3	3	4	3	4	3	3	23

Checking the chart, he finds a deficiency on the Wednesday afternoon shift and excesses on the Wednesday and Friday night. (One of these excesses is OK, since the original plan allows a one-shift excess.)

Martin's task now is to find a way of taking one of the night-shift excesses and adding it to the afternoon shift. To do this he changes the second week on the sequence from a Type 2 week to a Type 3 week. This transfers one shift from Friday night to Wednesday afternoon. His new sequence is 1-3-3-4-5-6-0-2-5-0.

At this point Martin also calculates how each of his 10 operators, A through J, will be assigned during each week of the 10-week cycle.

Type of Work Week	M	T	W	T	F	S	S	Week 1	2	3	4	5	6	7	8	9	10	
1	N			A	A	A	A	A	J	I	H	G	F	E	D	C	B	
3	A	A	A			N	N	B	A	J	I	H	G	F	E	D	C	
3	N	N	N			A	A	C	B	A	J	I	H	G	F	E	D	
4	A	A	A	A			N	D	C	B	A	J	I	H	G	F	E	
5	N	N	N	N	N			E	D	C	B	A	J	I	H	G	F	
6		N	N	N	N	N		F	E	D	C	B	A	J	I	H	G	
0			D	D	D	D	D	G	F	E	D	C	B	A	J	I	H	
2	D	D			A	A	A	H	G	F	E	D	C	B	A	J	I	
5	A	A	A	A	A			I	H	G	F	E	D	C	B	A	J	
0			N	N	N	N	N	J	I	H	G	F	E	D	C	B	A	
Shift: Day	1	1	1	1	1	1	1	7										
Shift: Afternoon	3	3	3	3	3	3	3	21										
Shift: Night	3	3	4	3	3	3	3	22										

Now the electricians—Scheduling them is Martin's next job. He needs 21 day shifts and 7 afternoon shifts—total, 28 shifts; 6 men, designated K through P.

For this work group Martin selects the combination and sequence 1-2-3-4-5-0. He first computes work periods and assigns shifts according to "Rules of Thumb."

Type of Work Week	M	T	W	T	F	S	S	Week 1	2	3	4	5	6	
1	D			D	D	D	D	K	P	O	N	M	L	
2	D	D			D	D	D	L	K	P	O	N	M	
3	D	D	D			A	A	M	L	K	P	O	N	
4	A	A	A	A			D	N	M	L	K	P	O	
5	D	D	D	D	D			O	N	M	L	K	P	
0			D	D	D	D	D	P	O	N	M	L	K	
Shift: Day	4	3	3	3	4	3	4	24						
Shift: Afternoon	1	1	1	1		1	1	6						

This sequence gives Martin 24 day shifts and 6 afternoon shifts against a need for 21 and 7. He must now change one of the day-shift excesses over to the afternoon. But this time a schedule rearrangement is not needed. He just changes the work-week sequence slightly as shown below.

Sequence:	1	- 2 -	3 ·	5 -	5 -	0	
Consecutive Work Days:	6	6	7	5	6		
Days Off:	2	2	2	4	2		

From this final master calculation he draws his working schedule. You'll see how it looks at the top of the next column.

Type of Work Week	M	T	W	T	F	S	S	Week 1	2	3	4	5	6
1	D			D	D	D	D	K	P	O	N	M	L
2	D	D			D	D	D	L	K	P	O	N	M
3	D	D	D			A	A	M	L	K	P	O	N
5	A	A	A	A	A			N	M	L	K	P	O
5	D	D	D	D	D			O	N	M	L	K	P
0			D	D	D	D	D	P	O	N	M	L	K
Shift: Day	4	3	3	3	4	3	3	23	Total				
Shift: Afternoon	1	1	1	1	1	1	1	7	Total				

With this system Martin has created a schedule that is economical, efficient, and fair to all his operators and electricians. True, he has more shifts than he needs. But they'll cost him less than overtime.

How You Can Schedule Even Shifts

Process plants (chemical, for example) and others that require the same number and kind of workers on each shift continuously can be best scheduled with a system called Even Distribution Scheduling (EDS).

In continuous operations, EDS will . . .

- Set up "most even" schedules for any number of men.
- Provide relief personnel exactly where needed.
- Advance off-days rotation as desired.

In addition, EDS requires no knowledge of complex scheduling once a master schedule is created.

EDS is based on the principle that all of the "50 Best" combinations are related to each other mathematically. In other words, by adding 1 to the numbers in any of the "50 Best" work-week combinations we will get another of the "50 Best." For example, adding 1 to the four-week combination 1-3-5-0 transforms it into 2-4-6-1. By simply rearranging the numbers to read 1-2-4-6, we have another of the "50 Best." Adding 1 to the numbers progressively will give another of the "50 Best" up to the limit of seven (basic work weeks). Then the process will start repeating itself.

Another feature of EDS combinations is that we can always produce them by counting by two's through the seven basic types of work week. Here's how it works:

Counting by two's, from Work Week 0 we get: 0-2-4-6-1-3-5-0-2-4-6-1-3-5-0-2-4-6-1-3-5 etc. If we segregate these numbers into groups of four, the resulting groups will duplicate selections in the "50 Best" chart.

The same applies to producing EDS groups of two, three, or five weeks corresponding to the "50 Best."

TAKE A COMPLEX PROBLEM

Consider a five-man production unit in a continuous-process plant. For every shift the unit requires a Class 1 operator, a Class 2, a Class 3, a Class 4, and a helper —a total of 5 employees per shift. The plant must run constantly, 3 shifts a day, 7 days a week. Labor requirement: 105 man-shifts per week, or the equivalent of 21 employees.

We count work-week types by two's up to the number of employees (21 in this instance, designated A through U in the tables below). The sequence is divided into groups of four, since four 5-shift work weeks come nearest to filling the 21-shift schedule. The extra shift is allowed for assignment of a relief man. Day-, afternoon-, and night-shift assignments are added—one 7-day shift period at a time. The chart below shows how the schedule looks. The relief man is assigned to relieve each position in turn on successive nights for five nights. The result is a schedule that mans every job, every shift.

	Employee	Work-week type	M	T	W	T	F	S	S
Class 1 Operator	A	0			D	D	D	D	D
	B	2	D	D			A	A	A
	C	4	A	A	A	A			N
	D	6	R	N	N	N	N	N	
Class 2 Operator	E	1	N			D	D	D	D
	F	3	D	D	D			A	A
	G	5	A	A	A	A	A		
	H	0		R	N	N	N	N	N
Class 3 Operator	I	2	N	N			D	D	D
	J	4	D	D	D	D			A
	K	6		A	A	A	A	A	
	L	1	A		R	N	N	N	N
Class 4 Operator	M	3	N	N	N			D	D
	N	5	D	D	D	D	D		
	O	0			A	A	A	A	A
	P	2	A	A		R	N	N	N
Helper	Q	4	N	N	N	N			D
	R	6		D	D	D	D	D	
	S	1	D			A	A	A	A
	T	3	A	A	A		R	N	N
Relief	U	5	N	N	N	N	N		

We can rotate shifts in EDS by moving all individuals or crews through day, afternoon, and night shifts on each successive work period—just as in Symmetrical Shift Scheduling.

Rotation of days off in EDS differs from the pattern in Symmetrical Shift Scheduling. In EDS we rotate days off by adding one to—or subtracting one from—each of the work-week types. For example, the work-week types for the Class 1 operators would be changed upward from 0-2-4-6 to 1-3-5-0. Those of the helpers would change downward from 6-1-3-5 to 5-0-2-4.

We can change work-week types weekly. If they are not changed weekly, they are usually repeated until the assignment of day, afternoon, and night shifts returns to its original status. This means, then, that on a three-shift schedule we would repeat the work-week types a multiple of three times before changing them. For example, changes could be made at the end of every 3rd, 6th, 9th, or 12th week of the schedule.

MANAGED MODERNIZATION At Work

Is your plant feeling its age like these plants at the right? Handicapped by obsolete facilities that cramp production and send costs skyward? Don't despair. At low cost, plus a little imagineering, you, too, can solve problems like these three . . .

1. SMALL OLD PLANT . . .

How to Modernize Old Plants

MOST PEOPLE would have given up on the three old plants at the top of these pages. But, thanks to their own far-sightedness and the guidance of an able engineering concern, management men in these plants turned discouraging disadvantages into cost-saving values. Plant 1 (below and right) added space by placing a process outside the building. Plant 2 (pages 94 and 95 converted to a continuous process by tearing out the building's innards. Plant 3 (same pages) invested shrewdly in alterations that wrought a near miracle in working conditions.

These three examples were selected by FACTORY editors from the files of Engineers, Incorporated (Newark, N. J.), consultant in each project.

1. Small plant adds space . . .

Fedders Corporation, Newark, N. J., bought this long, narrow building at a bargain price. But it had two major drawbacks: It wasn't nearly big enough—by 24,000 square feet—and its 40-ft. bays had no obvious utility. As the photos at the right show, Fedders overcame the space problem by moving the finishing processes to outside buildings. And turned the bay into useful space by using it for air drying.

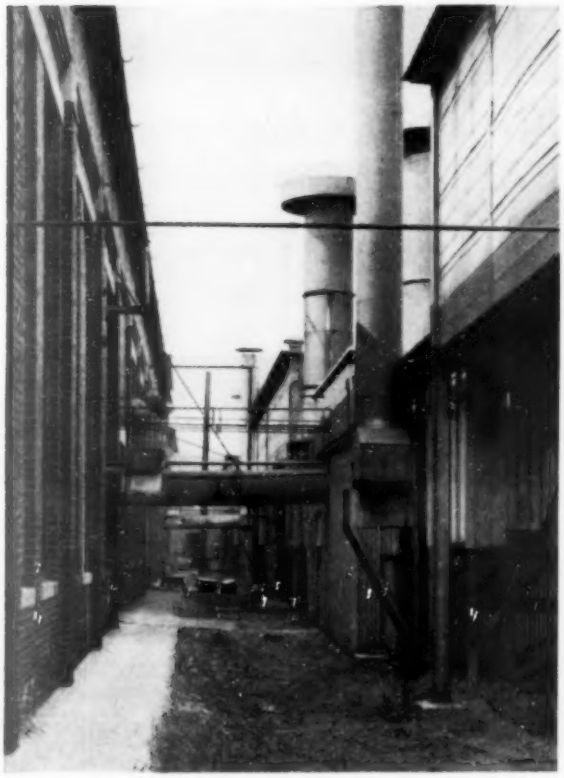
by sending parts outside . . .

Three chain conveyors tote stampings out of building into bonderizing unit at right. Conveyors totaling nearly a mile move parts from 540-ft.-long building into outside processing line (next photo). Savings on automatic processing and handling (not possible at old location) nets Fedders $100,000 yearly. Savings on buying old building vs. new came to a total of $700,000. Building alterations cost only $8000.

2. TALL OLD PLANT . . .

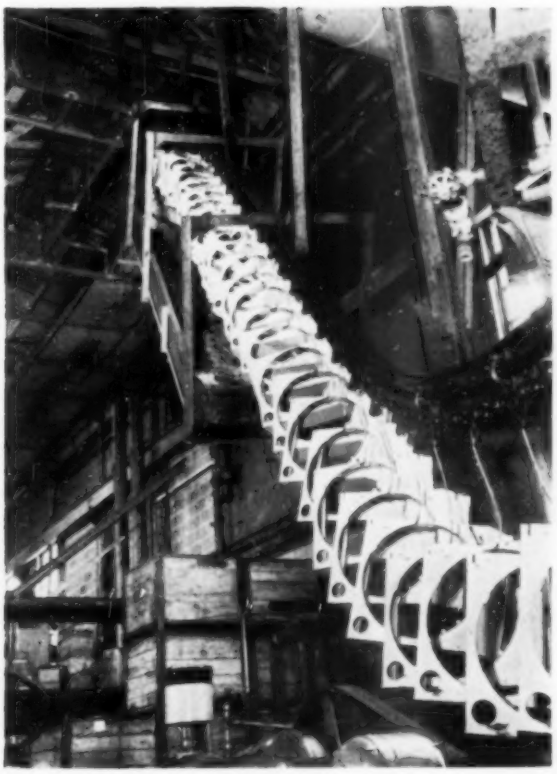
3. DARK OLD PLANT

for Higher Productivity



into a line of paint booths . . .

Stampings in photo at left leave main building through bonderite unit at far end of photo above. They continue forward through series of enclosed processing chambers (right) and back into building. Drying and baking ovens, degreasing, dip and drain tanks are shielded from weather by metal enclosures. Units extend parallel to building for 400 feet. Location minimizes fire hazards, venting problems.



back in and up to the roof.

Returning parts, needing flocking, go up into 40-ft. bay for air drying. Saves floor space, cost of oven. Uses five times as much conveyor track as oven, but still is cheaper. Fedders also avoided hanging utilities and 2-ton monorail conveyor from high bay. Did so by supporting them on frame formed by tying existing jib cranes together with structural steel.

Turn the page

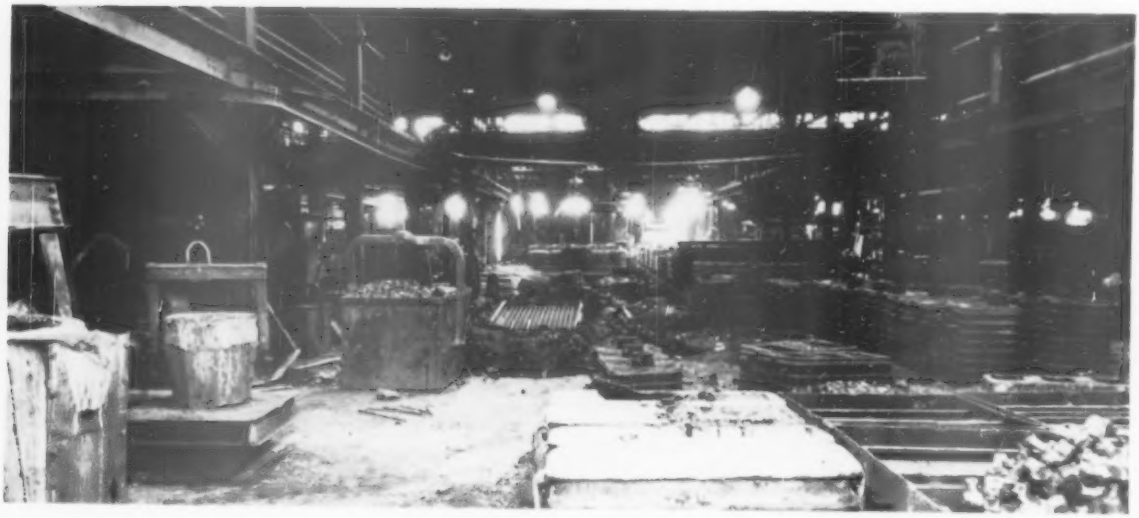
2. Tall plant improves flow

Chesebrough-Ponds, Inc., Perth Amboy, N. J., used this 4-story, 28,000-sq.-ft. building for years for experimental processing and bulk storage. Company's famed Vaseline product was compounded in batches in a nearby building. Problem facing Chesebrough-Ponds and Engineers, Incorporated, was to convert the process from batch to continuous operation, install it in this building. To see how job was done, follow the story told in the photos at the right. They're about . . .

Begins on page 92

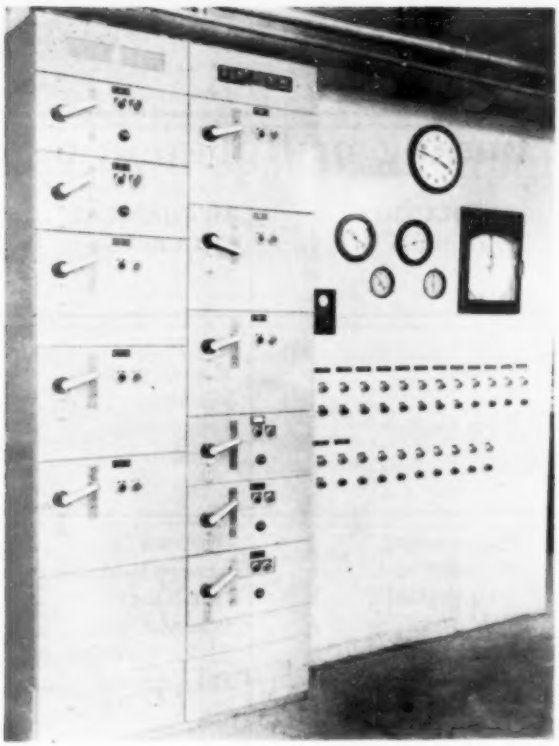
Tearing out and squeezing in . . .

For continuous flow, holes were punched in walls, floor sections torn out, automatic handling and processing equipment squeezed in. Steel plate supports brickwork above gap torn for conveyor belt. To install petrolatum percolator, unit was cut in two. Upper half was shoved in from first floor, then raised. Lower half was placed beneath, welded to top half. Change from batch to continuous took three months.



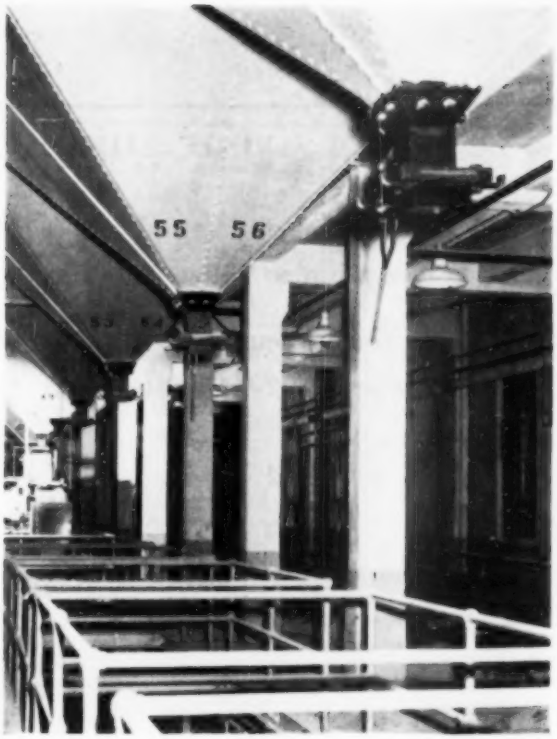
3. This dark old foundry was picked up for a bargain price . . .

Federal Pacific Electric Company, Newark, N. J., picked up this 165,000-sq.-ft. foundry (plus 10 acres) at a bargain. Building had no floors, no sprinklers, little light, a forest of columns. Total cost of building alterations, plus a new 40,000-sq.-ft. addition as compared to new building, saved Pacific Electric about $435,000 in capital outlay.



installing automatic controls . . .

Typical of changes made is control panel at right. Panel controls pumps and conveyors, was designed and built by Chesebrough-Ponds engineers. Enables plant to handle process with minimum of direct labor. Wiring and lighting are explosion-proof. Cost of layout, design, and installation of entire process will be amortized in less than two years from operating savings. Sale of old building added cash, saved on taxes.



and making a new interior.

Clean, trim, bright, and efficient interior now speeds production. Bins on upper floors drop dry material into blending tanks. Building (only 33 feet wide) hardly feels its cramped quarters. Plant shows improved exterior to public. Brick building (far left photo) was sprayed with Palladium Mastic (50¢ per square foot). This gave it new light-grey color, waterproofed it, made it acid- and alkaline-resistant.

. . . but now, redesigned and rebuilt, it's a modern plant.

Building now houses heavy presses, uses high-bay area (left) for coil storage. Floor is creosoted wood block. Plumbing and lighting are new. Many columns have been removed. Existing floor channels now distribute utilities. Alteration costs per square foot: super-structure, $1.62; lighting, $0.73; heating and ventilation, $0.68.

Here's your guide for finding malfunction detector

These are plant operating problems. Same headings in text below will . . .	PRODUCTION TROUBLES	MECHANICAL TROUBLES
. . . guide you to detectors that will monitor one or more of these elements and thus . . .	Product Tool Parts ejection	Weight Moving part Vibration Temperature Sound
. . . give you warning of upcoming crises in these plant trouble areas.	Parts sticking Improper stock feed Tool breakage Tool wear Tramp metal	Overload Abnormal motion Imbalance Excessive wear Excessive vibration Misalignment Shock

What Today's Malfunction

They're automatic watchdogs. They never sleep. They'll monitor processes and equipment, protect your plant and your workers, warn you of coming troubles.

PHONE RINGS at 4 a.m. It's the plant. Unexpected trouble. Pit booster pump down—no water pressure anywhere. Somebody piled insulation for repairs on the ventilation grate. Motor got overheated, burned out before anybody suspected anything was wrong. Means two shifts production lost, 200 men idle.

Or it's stock jammed in the three-stage punchpress. Die damaged. Will cost $4000 and a week to fix. Rush orders will be held up, too.

Or still worse, it's an explosion from a gas accumulation in the subbasement. Watchman in the hospital. Damage: thousands of dollars.

These are an operating manager's nightmares. The more complex production processes become, the more trouble a breakdown can cause. Highly mechanized, high-production machines and processes are wonderful when they work. But a costly investment stands idle if even a simple failure comes along. And a major plant catastrophe can put you out of business. Insurance won't cover the orders you lose while you rebuild.

Can you do anything about it? Yes, because out of this basic fact of modern plant life has come a new concept in preventive maintenance —automatic warning of approaching equipment or process failure. Today's malfunction detectors will warn of coming trouble in time for you to forestall it. They are an easy step toward automatic maintenance. They monitor your operation, verify that everything is working as designed. They *warn* you when it isn't, and they identify the faulty component. They're just what you need—easy and mostly low-cost solutions—if you're looking for the following:

- Easier, lower-cost maintenance.
- Higher output.
- Better quality.
- Fewer rejects.
- Improved worker safety.
- A safer plant.

WHAT TROUBLE SLEUTHS DO

It's not so much what they are as what they can do. Some can be as complex as new automated machinery itself. For instance, the electronic system that records and charts the size of parts made by an automatic screw machine. It will give you information on quality control and tool life, keeps an eye out for breakage, bearing failure, and motor overload. But most detectors are simple, like the thermocouple that warns of high temperature and fire in a drying oven. This fact is com-

that will spot plant trouble before it starts

ELECTRICAL TROUBLES	TEMPERATURE TROUBLES	PRESSURE TROUBLES	PERSONNEL HAZARDS	MULTI-OPERATION TROUBLES
Amperage Voltage Power consumption Torque	Material temperature Process temperature Temperature acceleration Infra-red radiation	Pressure Fluid flow Vacuum Lube volume Differential pressure	Atmospheric composition Alpha, beta, gamma radiation	Combinations of any measurable elements
Short circuit Ground Overload Power failure Phase failure Load changes	Over-heating Under-heating	Excessive pressure Plug-ups, stoppages Pressure drop Pressure failure Unstable vacuum Low lube level Clogged air filter	Explosive gas Toxic gas Radioactivity	Failure of any combination of measurable elements

Detectors Will Do for You

mon to all of them: They warn you that trouble is on the way.

Detectors fall into two groups:

1. Built-in—These are designed into equipment by the original equipment manufacturer. They come with the machine or are optional extras. They can be expensive, but they protect a big investment.

2. Add-on—These update and improve existing equipment. Some are made to fit a particular machine by the original manufacturer, but most are devices that have a wide range of applications. It may take some ingenuity and work to adapt them to your needs.

There are so many kinds of add-on detectors made by numerous manufacturers that no one can really say how big the business is. But the field is growing rapidly in response to management's need. FACTORY estimates that there are at least 300 manufacturers, with total sales of about $240-million a year. This article shows some of their products.

If you're buying new equipment, see if the manufacturer offers malfunction-detector features as options. Get them when you buy equipment—they usually cost less as part of the original equipment. Or add them to old tools. Only on really complex jobs will you need a consultant or an outside engineer. Some jobs will be "plug-ins"—a perfect fit and application. But don't give up because you can't find a malfunction detector made especially for your needs. Use your ingenuity. You can rig many of these devices to do more than one job, and you may find that you can use one for a purpose entirely different from its designed purpose.

HOW TO PICK THEM

What's the malfunction you want to prevent? Look at the table at the top of the page. Suppose you've got troubles with production equipment. Look below in the lowest section of the column headed "Production Troubles" and find your problem. Say it's "Parts sticking." If you now look just above in the same column you'll find you can get malfunction detectors to warn you of coming trouble by monitoring the tool involved, the parts-ejection mechanism, or the loading—any of which might cause parts to stick.

Likewise, in the text that follows you'll find a section headed "Production Troubles." There you'll see a list of malfunction detectors now commercially available. One of them may be just what you need. If you don't find exactly what you need, you may be able to adapt one of the listed items to your purpose. Imagination—and equipment manufacturers—can be a lot of help.

This roundup obviously doesn't include all malfunction detectors. There are many more good ones on the market. But we've checked all FACTORY "Equipment News" pages for the past four years and come up with these. They will suggest what you can look for—and what you can gain by looking.

Turn the page

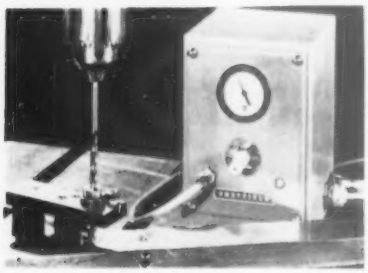
These watchful devices will warn you about . . .

PRODUCTION TROUBLES

They'll check whether a machine is functioning as designed. They'll warn if parts are sticking, if tools break, if feed mechanisms jam, or if a machine is overloaded. Some use photocells to monitor parts-ejection delivery and tools. Others are alert for motor overload, any variation in a load, or any variation in a process cycle.

Mechanical Overload Detector ("Flexostop") protects press and dies against double feeding and jams. No electronics or ammeters needed. Detects improper deflection of flywheel, stops press, and rings alarm if overloaded. Precision Welders & Flexopress Corporation, Cincinnati.

Double-Stop Press Control prevents damage to high-speed automatic punch-presses and dies. If a "double" is fed into die—or a hard, thick single piece—control disengages clutch, de-energizes ram, warns operator to remove peice. Tipptronic, Inc., Chagrin Falls, Ohio.



Faulty Drill Detector, for multiple- or single-station drilling machines, eliminates need for separate probing station. Broken or missing drill causes pressure drop in pneumatic circuit, flashes activate lights. The Sheffield Corporation, Dayton.

Press Control prevents operation until piece is properly nested. No second stroke till piece is removed, another blank inserted. On automatic set-ups, press stops when jamming occurs or end of strip or coil is reached. General Automation Corporation, Flushing, N. Y.

Simultaneous Position Detector monitors any die-cutting or machining operation, detects malfunction magnetically or photo-electrically. Stops machine if cycle fails. Custom-built to any operation, handles from 2 to 25 or more cutting heads. Sterns Control, Great Neck, N. Y.

"Circuit Master" protects power presses, injection molding machines by monitoring products as they eject. Automatic machine cut-off before a "double" occurs. Buckling, end-of-material, and misfeed attachments available. Requires adjustments. Wintriss Inc. New York.

Punch Press Protector ("Detex") electronically detects the ejection of a part from the dies. If failure occurs in ejection operation, the device stops the press before the next stroke is made. The unit ties into the press brake or the clutch controls. Goldak Company, Inc., Glendale 1, Calif.

"Tool-Gard" is a dual-purpose instrument for measuring loads. It's designed for use on almost any machine-tool operation. Gives constant visual indication of tool wear and monitors machine-tool overloading or underloading. Futurmill, Inc., Pontiac, Mich.

"TorqueTrol" device automatically supervises unattended machines. Besides controlling tool feed it detects jamming, tool wear, faulty lubrication, etc., and stops machine or sounds alarm. Can be used to count or record work, too. Electronic Control Corporation, Detroit.

Electronic Metal Detector inspects flexible sheet goods during production. Sensitive enough to spot stray metal specks as small as a typewriter period. Can be used for plastics. Dual payoff: both product and equipment are protected. Radio Corporation of America, New York.

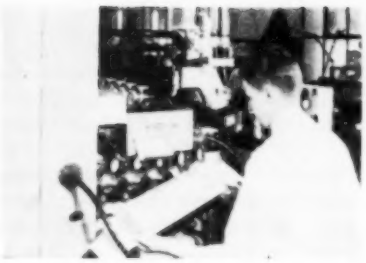
"Die-Saver" reduces or eliminates possibility of damage to presses or expensive dies due to "double heading" when parts fail to eject. Reduces chance of accidents, allows faster automatic feeds, permits operator to control more than one press. Robotron Corporation, Detroit.

Proximity Transducer System detects metal objects without contact. Finds up to 1000 per second, ¾ inch away, through plastics, paper, pasteboard, or wood. Used in counting, controlling motors or valves, actuating warning devices. Electro Products Laboratories, Chicago.

Tramp-Metal Detector performs inspection on bulk goods or packaged products at high speed. The device signals and rejects contaminated

materials (ferrous or non-ferrous) that pass through a test coil. It's a semi-mobile unit. It works at conveyor speeds up to 1000 fpm. J. W. Dice Company, Englewood, N. J.

Overload Switch detects overloads caused by broken drills and misaligned tools. The unit stops the machine, gives an alarm. Four models now available handle any size motor. This detector operates on 110-volts, a-c. It's easy to install. J. I. C. Electric Company, Detroit.



"Monitorecord" times and records up to 14 simultaneous or sequential machine operations, gives visual chart to compare with "master" made when machine was new. Hooked to control circuit of machine, is accurate to 1/100 sec. Sheffield Corporation, Dayton.

Excess Power Detector for automatic-feed machine tools quickly senses momentary increases in motor current, changes in normal load. "Ex-Po-Det" operates on any voltage a-c or d-c motors up to 1100 volts, 20 amp. Almy, Hayden & Maxwell, Inc., Marblehead, Mass.

These detectors will warn you about . . .
MECHANICAL TROUBLES

These monitors will give you warning of failure that results from wear, misalignment, or imbalance. They'll measure vibrations, sound, or heat that are often the symptoms and signs of wear and tear. They work through mechanical, auditory, or electronic sensing units. They're available in portable or permanent-installation models.

Vibration Analyzer System offers five portable models for balancing machinery while operating. Gages and scopes analyze imbalance, strobe lights locate balance weights. Special models for low frequencies. International Research & Development Corporation, Worthington, Ohio.

Motion Indicator ("Roto-Guard") indicates motion or stoppage of normal motion, energizes an alarm signal to warn operating personnel or to operate control switches. Prevents costly damage to materials or machinery in obscure areas. The Bin-Dicator Company, Detroit.

Hand Vibrograph is a compact, self-contained instrument for recording machine vibration on a continuous paper chart. Measures amplitude and frequency, shows wave forms in detail. No battery or outside power source. Portable. The Vibroscope Company, Glenford, N. Y.

Overload Device for maker's line of sit-down trucks warns driver of over-capacity load—or when load has shifted to a dangerous position. Light or bell signal protects against driver injury, damages to vehicles and materials. Lamson Mobilift Corporation, Portland, Ore.

Impact Recorded ("Impact-O-Graph") notes shocks, jolts, and vibrations from any direction, tells when impact occurred, reports event on wax-coated tape. Takes jolts all the way up to 100 "g's." Models built for tape record for 28 days. Clock model records for four months. Unit is battery powered. The Impactograph Corporation, Cleveland.

Binaural Sound Detector amplifies inaudible noises caused by defects. Locates broken, loose, worn, bent parts in reciprocating engines, motors, similar units. Looks like doctor's stethoscope, can be built in. Burke & Company, Worton, Md.

Electronic Stethoscope is handy battery-powered transistor tool to inspect machinery. "Detecto-Scope" picks up vibrations in machinery, amplifies electronically. Portable or built-in indicators. Valley Engineering Corporation, Easton, Pa.

Turn the page

Vibration Monitor System protects rotating and reciprocating equipment. Non-electric. "Vibraswitch" senses increases in vibration, but ignores starting vibration and normal transient shocks. Aeronautical & Instrument Div., Robertshaw-Fulton Controls Company, Anaheim, Calif.

Portable Amplifier senses noise energy, tells if bearings are a trouble spot. Has metal probe, electronic amplifier, calibrated meter. Detects failure or wear in rotating, sliding, or moving part. Also for mating close-tolerance parts. Sperry Products Inc., Danbury, Conn.

"Inertia Switch" is actuated by thrusts, impacts, or excessive vibrations. The device protects equipment that is unattended or isolated in the plant. If unusual vibrations occur, the switch (Model 1sA1) shuts off the machine or sounds an alarm. Micro Switch Div., Minneapolis-Honeywell, Freeport, Ill.

Hand Vibrograph simplifies maintenance by taping vibration readings of machines at regular intervals. When compared, tapes show progressive wearing of bearings, cutting tools, etc. Unit is lightweight (under 5 pounds). The Korfund Company, Inc., Long Island City, N. Y.

These trouble sleuths will notify you of . . .
ELECTRICAL TROUBLES

They'll protect you against electrical failure in equipment or power supply. They'll detect overloads, short circuits, phase failure, load changes, and excess power consumption by checking voltage and amperage by electrical, magnetic, or electronic means. Most of them are wired into the power circuit, but some can be used for portable checks.

Fault Finder monitors control circuits continuously, indicates faults in any of as many as six circuits. The device needs no warm-up time. Uses printed circuits and standard electronic components. It is electrically isolated from monitored circuits. Westinghouse Electric Corporation, Pittsburgh.

Single Monitoring Instrument for control of power is now possible with a new locking contact wattmeter that permits pre-setting watt limits. Instrument's calibrated for reading and controlling at 110, 220, or 440 volts a-c. Assembly Products, Inc., Chesterland, Ohio.

Machine Load Control protects motors against overload, underload, no load, and single-phasing. Adjustable limit pointers on two ammeters actuate warnings, shut down machine. Indicating pointers monitor load on motor on twin dials. Tipptronic, Inc., Chagrin Falls, Ohio.

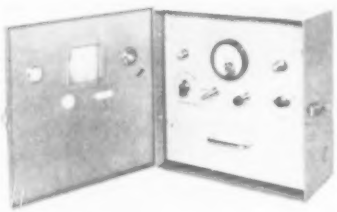
Overload Device protects many types of motor-driven machines and tools. When load exceeds pre-set value, "Automatic" gives visible warning, actuates auxiliary equipment to stop motor or take other measures. Cardinal Control Company, New Britain, Conn.

Electronic Ground Alert warns visibly and audibly of line-to-ground faults before insulation resistance drops to zero ohms (a dead short). Can be set to go off at any resistance from 7500 to 0 ohms. Portable or stationary models. Delta Engineering Sales Company, Shreveport.

A-C Current Monitor, equipped with thermal-type movement and built-in relay, detects and controls minute changes in a-c electrical loads. It handles up to 20 amperes directly. Ranges from 0-5.0 or 0-200 amperes. Control span is adjustable from 5 to 100% scale. Technique Associates, Indianapolis.

Overload Safety Control, for conveyors with electric motor drive, responds to slight tug on trolley hanger. Safety shut-off point is set on ammeter. If line pull exceeds limit, conveyor motor shuts off instantly. Conveyor Div., American Monorail Company, Tipp City, Ohio.

"Circuit Sleuth System" simplifies trouble-shooting on the complex electrical control panels used for automated machine tools. When a machine goes down, special pilot lights on the panel go out to indicate the exact trouble spot. Snyder Tool & Engineering Company, Detroit.

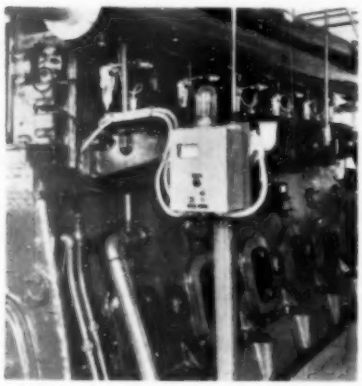


Overload Detector protects electric-driven machinery against damage from load changes or stock runout. It's called "Monitron." It continuously measures power drawn, and it senses changes within milliseconds. Stops motor or applies brake, signals a warning simultaneously. Sperry Products, Inc., Danbury, Conn.

These malfunction watchers will tell you about . . .

TEMPERATURE TROUBLES

Overheating or underheating causes these monitors to sound warnings. Some are thermal devices—thermostats, thermocouples, fusible elements. Others work on the pyrometer principle, gaging temperature by radiation given off by a warm body. Some are tied into cold storage vaults. Others protect ovens, dryers, or bearings from overheating.



Temperature Monitor uses scanning control for measuring temperatures from −200 to +3000 F. Handles up to 24 stations in sequence. Abnormal condition at any point is instantly indicated by a warning light—and by alarm if desired. Assembly Products, Inc., Chesterland, Ohio.

Overheat Detector-Alarm detects any temperature rise that might damage your equipment—and lets off a smoke and/or smell warning. You need no electric or battery connections—just fasten it to the spot you want to monitor. Humphrey-Wilkinson, Inc., North Haven, Conn.

Bearing Overheat Detector is a miniature thermostat—weighs only 1 ounce. Supplied with settings to 550 F. Warns of overheat in motor bearings, gear boxes, universal joints, clutches, generators, alternators, etc. Easily installed. Vapor Heating Corporation, Chicago.

Infra-Red Radiation Pyrometer remotely measures temperature of moving objects in process, locates inaccessible hot spots. On line of sight, measures without contact or interrupting process. Servo Corporation of America, New Hyde Park, N. Y.

"Pyrotrol" Temperature Control, a non-contacting optical system, reacts to moving heated objects many feet away. Will start a process when work passes a given point, or control a set point in a foundry crucible. Range: 950-2000 F. Mason Instrument Company, Mount Vernon, N. Y.

Temperature Monitor ("Limitemp") controls heat within ± F., in 100 to 400 F. range. Uses no electronic tubes. Useful for bearings, motor windings, materials in process. Light signals when unit is restoring heat to level desired. Westinghouse Electric Corporation, Pittsburgh.

Line Temperature Detector is a long Inconel tube that detects high temperatures over hundreds of feet away. Heat causes shorts between core and tube wall, gives alarm. Comes in eight temperature ranges from 255 to 1200 F., can be bent to shape. Fenwal Inc., Ashland, Mass.

"Evapograph" is a direct thermal image camera. The device records a full-color picture of heat patterns. Application: for hot spots in machinery, in steam lines, in mill equipment. It detects temperature differences as little as 1 C., objects up to 3 miles away. Baird-Atomic, Inc., Cambridge, Mass.

Heat Monitoring System (−25 to +600 F.) warns when any sensing point reaches selected high or low limit. No sampling or scanning device. Any number of points continuously monitored. Alarm persists until all trouble points have been checked. Fenwal Inc., Ashland, Mass.

Temperature Acceleration Indicator anticipates bearing failure in rotating machinery by detecting acceleration of temperature rise. For gear boxes, generators, gasoline engines, jet engines. A precision device. Lycoming Division of Avco Manufacturing Corporation, Stratford, Conn.

Temperature Shutdown Switch (Model 6A426G) consists of a sensing bulb and capillary connection to switching mechanism. At preset temperature switch opens or closes to disconnect power or sound alarm. Four ranges, from 30 to 700 F. General Electric Company, Schenectady.

Temperature Indicator Monitor (TIM) scans up to five thermocouple inputs per second, gives alarm if readings drift above or below limits. No interruption during readout on indicator. Accuracy 0.5% of full scale. Kybernetes Division, Hagan Chemicals & Controls, Inc., Pittsburgh.

"Thermo-Alarm" sounds a warning buzzer when unsafe temperature is reached in refrigerators, freezers, sterilizers, vaults, etc. Plugs into 110-115-volt a-c, 60-cycle outlet. Thermostats calibrated to temperatures from −10 to +300 F. Mack Electric Devices, Inc., Wyncote, Pa.

These hawkeye monitors will warn you of . . .

PRESSURE TROUBLES

These pneumatic or electronic devices will detect drops or surges in hydraulic and vacuum systems. They'll protect anything using pressurized gases or fluids under pressure in a process or lube system. They'll tell when air filters are clogged. They'll do more than the usual pressure gage—they'll give warning if failure threatens.

Compressor "Oil Monitor" uses a micro switch that keeps compressor from starting new cycle unless enough oil is in crankcase to do lube job. Re-sets itself when oil is added. Champion Pneumatic Machinery Corporation, Princeton, Ill.

"Cyclesafe" stops machinery when lube pressure drops below setting. But machine stops only after work cycle is completed—eliminating damage. Seneca Falls Machine Company, Seneca Falls, N. Y.

Turn the page

Vacuum Static Pressure Control is for very low vacuums where regulation is needed in inches of water column. Useful on equipment requiring safeguards for assuring specific vacuum to prevent hazards; e.g., combustion equipment. Henry G Dietz Co., Long Island City, N. Y.

Cut-Off Switch, to protect water systems, stops pump's operation when water pressure falls below safe pre-set level (approximately 5 or 6 pounds). Switch, which is rated at 1 hp., 110-220 volts a-c, is actuated by pressure from pump. Furnas Electric Company, Batavia, Ill.

Safety Gas Regulator shuts off automatically in case of main pressure failure, in case of diaphragm failure, or in case of overloading. The device must be manually re-set. And for protection against fire it shuts off instantly at 300 F. and can't be re-set. Gas Appliance Specialties Company, Inc., Woodside, N. Y.

Safety Lube System is a package for heavy process and machine equipment, comes in 10-, 25-, and 50-gpm. capacities. "Protecto-Lube" shuts down machine, douses green light, and sounds warning horn for oil pressure, temperature, leaks. Nordberg Mfg. Co., Milwaukee.

"Lube-Line Alert" is a protective device for force-feed lube systems. Easily installed at each terminal point of lubrication to monitor lube flow. If flow is interrupted, it will activate any signal system you attach. Manzel, Buffalo.

Pointer Draft Gage indicates and controls pressure of gases or air. Integral magnetic mercury switch operates alarm or signal light when high or low limits are exceeded. For monitoring resistance in ducts, filters, blowers, fans. Ellison Draft Gage Company, Chicago.

Portable Hydraulic Tester checks performance, operation of hydraulic systems, components, other equipment—a system to actuate a ram on a machine tool, for instance. Detects fluid leakage, exact place and cause, internal or external. Highly mobile. Greer Hydraulics, Jamaica, N. Y.

Gage tells if air filters are clogged and if they need replacement or cleaning. Highly visible. Simple, direct reading. Device measures pressure, vacuum, or differential. No moving parts. For air conditioning and air-cooled equipment. The Henry G. Dietz Company, Long Island City, N. Y.

These malfunction minders will warn you about . . .
PERSONNEL HAZARDS

They're designed to save valuable material as well as lives. They'll detect escape of toxic and explosive gases—and harmful nuclear radiation. Some units have interchangeable elements to monitor more than one kind of gas. The radiation measuring devices are of growing importance as industry uses more radioactive materials that are costly and dangerous. These systems spot immediate and cumulative radiation.

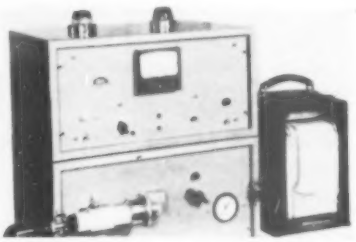
Radiation Detector, weighing under 5 pounds, indicates leakage and true dose of x-ray installations. Also shows strengths of radioisotopes in laboratories and plants. Battery-operated, two controls are range switch and zeroing knob. Victoreen Instrument Company, Cleveland 3.

Portal Radiation Monitor spotted in entrance or exit quickly locates radioactive contamination on persons passing through. Visual and audible alarms indicate the presence of contamination. Nucleonic Corporation of America, Brooklyn, N. Y.

Radiation Dosimeter is pen-sized. It detects and gives visible warning of dangerous exposure to radiation. The device is easy to use, self-contained. Charges and recharges simply by shaking. It provides a cumulative measurement and an instantaneous reading. Electromation Company, Santa Monica.

"Air Monitor" is for plants that work with radioisotopes—or for any operation where airborne particulate radioactivity is a problem. The device simultaneously measures and records activity of airborne particulates, gives alarm. It's easy to decontaminate. Nuclear Measurements Corporation, Indianapolis.

"Duotector" combustible-gas detector sounds alarm in presence of all hydrocarbons. Twelve-pound unit is portable (nickel-cadmium batteries) or permanent (110-volt a.c.). Can operate 100 feet from probe unit. Measures gas concentration. Crump Instrument Company, Houston.



"Windjammer" detects alpha-beta-gamma radiation, serves equally well as area monitor and airborne particulate monitor. Warning and alarm system may be set at any desired level. Device employs magnetic

shielding, weighs about 175 pounds. Recorder optional. Nuclear Measurements Corp., Indianapolis.

Explosive-Gas Alarm consists of weather-resistant area detector and remote control box. Flashback-proof electronic detector senses combustible gas. At 0.2 of lower explosive level, light flashes on box. Johnson-Williams, Inc., Palo Alto.

Sonic Gas Analyzer monitors gas mixtures by continuous or batch control. It detects minute amounts of harmful gases in areas with pollution or personnel problems. Designed for exceptional range and sensitivity, the unit provides rapid analysis. National Instrument Laboratories, Inc., Washington.

These detectors will put you on notice about . . .
MULTIPLE TROUBLES

These devices are for the manager who feels he has too many things to monitor, like a hundred identical machines or a dozen variables on each major process. They're more complex than those already listed—can be more costly, too. But they centralize information, give immediate notice of malfunction, tell when, where, why it's happening.

This array of detectors is the last step toward automatic inspection and maintenance. It will help you protect your whole plant and process. It will monitor all the factors that can cause you trouble, such as temperature, pressure, cycle timing, electrical variations, or some combination of these, then feed the information to a central point. All items listed here have either visual or auditory alarms, or both.

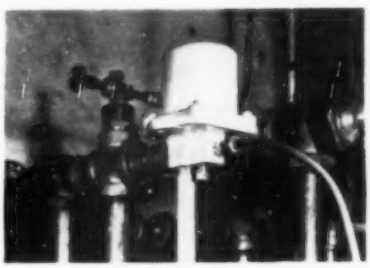
Visularm Condulets provide at-a-glance warning of dangerous operating conditions in manufacturing processes. A light, horn, siren, or bell signal indicates abnormal temperature, pressure, liquid level, speed, load, or other condition. Crouse-Hinds Co., Syracuse, N. Y.

Low-Cost Alarm System for medium and small factories is automatic. It's easily installed by plant men. Offers many optional arrangements and other alarm uses. Switches itself to battery when power fails. Cost: about $200 installed. The Edwards Company, Norwalk, Conn.

Shutoff and Alarm, for automatically controlled heat processes, works without sensing elements or electronic circuitry. For heat-treating furnaces, other pressure or flow processes using an on-off, 2 position, or pulsing type of control. Damol Corporation, Philadelphia.

Versatile System offers visible and audible (to 2500 feet) warning for equipment failure or overload, for hazardous conditions or intrusion. Specially adapted to mechanized production lines and to areas not under continual observation. Sparton Corporation, Jackson, Mich.

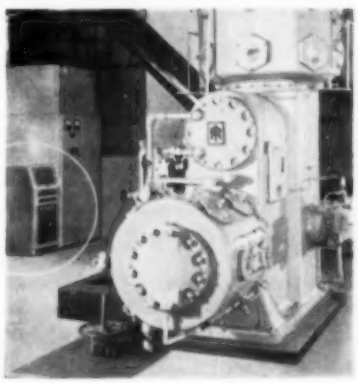
Scanner-Monitor continuously on checks temperature, pressure, other process variables, records readings and time, alarms if out of limits. Also records all conditions if major breakdown occurs. Several packaged systems. Information Systems, Inc., Skokie, Ill.



Pressure and Temperature System ("Omniguard") monitors heat and pressure points, warns of danger. Resistance units give continuous temperature signals from 150 to 1350 F., pressure capsules and Bourdon gages read to 3000 psi. Thos. A. Edison Industries, West Orange, N. J.

"Monitron" is a transistor system that scans from 3 to 256 points, reports signal over telephone, telegraph lines. For alarm monitoring, remote and unsupervised processes. Available as plug-in package unit or custom-tailored system. Moore Associates, Redwood City, Calif.

Combination Alarm-Control features high-reliability, powerful coil-operated mercury switches. Monitors any process or plant variable. No relays. Flashing light alarms, steady light (same color) acknowledges, steady (different color) says clear. Electro Devices, Inc., Chicago.



Automatic Compressor Control System ("Tendamatic") in remote console continuously supervises compressor operation. Gives warnings if malfunction occurs and shuts unit down if not adjusted. For machines of 100 to 7500 hp. Ingersoll-Rand Company, Phillipsburg, N. J.

Automatic Scanner monitors process measurements, gives visible and audible alarm. Scans up to 5 points per second. For multiple furnaces, reactors, power plants. Automatic re-set, optional tape memory unit. The Foxboro Co., Foxboro, Mass.

PAY RATES FOR KEY INDIRECT JOBS—IN 7 CITIES

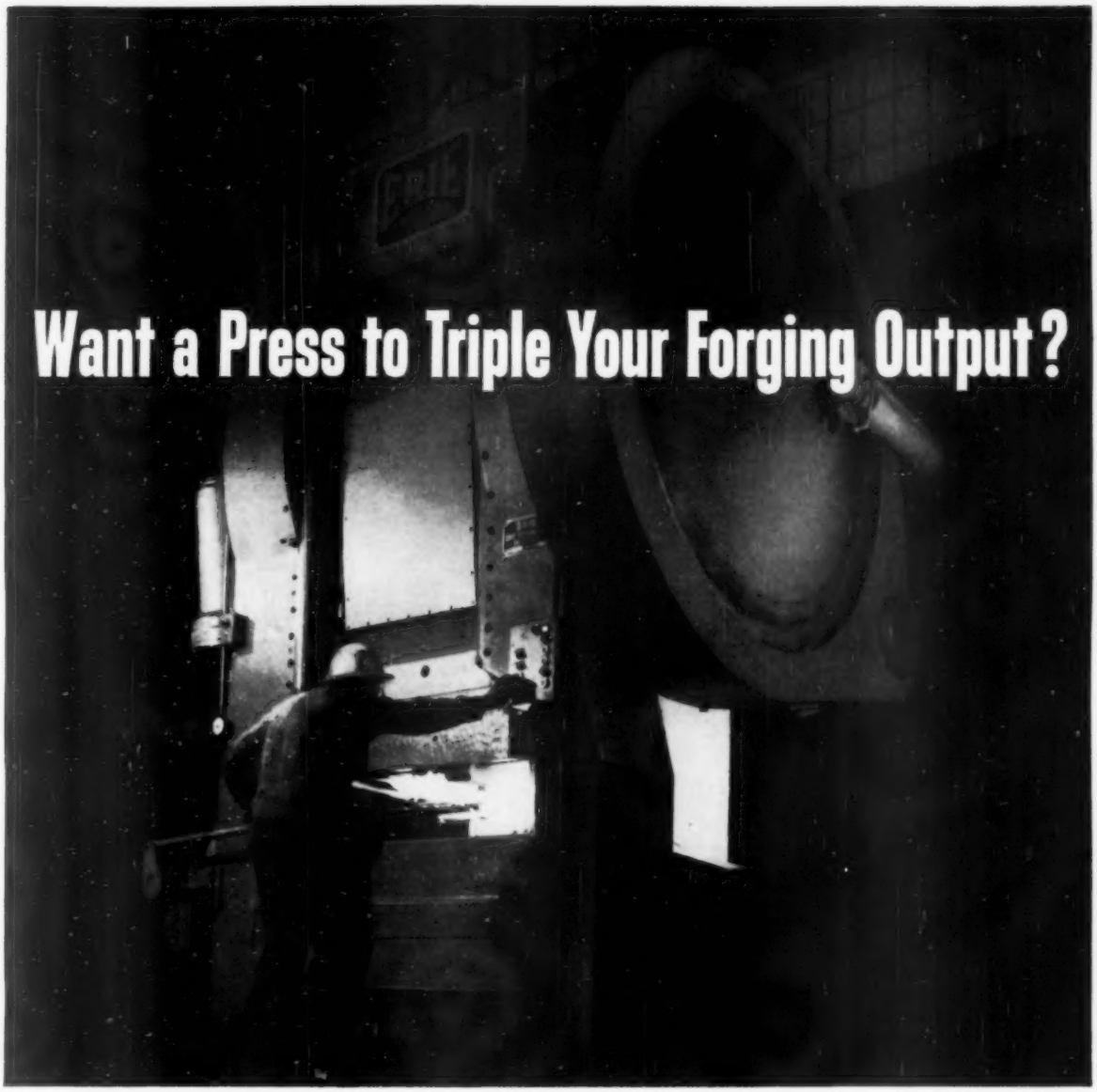
● All figures are average straight-time earnings in manufacturing industries except figures with asterisk, which are for *all* industries. They include incentive pay, if any, but *not* overtime, weekend, holiday, or night-shift premium.

Weekly earnings are average salaries for standard work week.

	MALE JOBS, EXCEPT WHERE OTHERWISE SHOWN	AVERAGE STRAIGHT-TIME HOURLY EARNINGS						
		ATLANTA MAY 1959	CHICAGO APRIL 1959	LOS ANGELES-LONG BEACH MARCH 1959	MILWAUKEE APRIL 1959	NEW ORLEANS FEBRUARY 1959	NEW YORK CITY APRIL 1959	PORTLAND, ORE. APRIL 1959
Maintenance and Powerplant Jobs	Carpenters, maintenance	$2.20	$2.77	$2.74	$2.69	$2.34	$2.63	$2.81
	Electricians, maintenance	2.74	2.99	2.94	2.87	2.76	2.81	2.94
	Engineers, stationary	2.50	2.93	2.97	2.76	1.95	3.13	2.74
	Firemen, stationary boiler	1.64	2.35	2.67	2.38	1.65	2.58	2.26
	Helpers, trades, maintenance	1.98	2.41	2.30	2.08	1.86	2.03	2.21
	Machinists, maintenance	2.47	3.02	2.93	3.01	2.67	2.84	2.92
	Mechanics, automotive, maintenance	2.11	2.80	2.80	2.72	2.15	2.63	2.58
	Mechanics, maintenance	2.11	2.73	2.75	2.71	2.57	2.70	2.85
	Millwrights	–	2.91	2.91	2.71	–	2.75	2.85
	Oilers	1.70	2.33	2.27	2.42	2.00	2.22	2.32
	Painters, maintenance	2.69	2.77	2.70	2.77	2.45	2.73	2.90
	Pipefitters, maintenance	2.80	2.99	2.93	2.83	2.42	2.66	2.86
	Sheetmetal workers, maintenance	–	3.02	2.93	2.91	–	2.66	2.87 *
	Tool and die makers	–	3.16	2.99	3.16	–	2.87	–
Custodial and Material Movement Jobs	Guards	2.32	2.16	2.26	2.10	2.09	2.05	–
	Janitors, porters, and cleaners	1.52	1.89	1.99	1.99	1.49	1.69	1.90
	Janitors, porters, and cleaners (women)	1.20	1.69	1.85	1.66	1.26	1.67	1.68
	Laborers, material handling	1.53	1.99	2.15	2.17	1.45	2.09	2.11
	Order fillers	1.48	2.06	2.09	1.99	1.30	1.70	2.23
	Packers, shipping	1.59	2.00	2.07	2.14	1.35	1.68	2.13 *
	Packers, shipping (women)	1.40 *	1.78	1.93	1.79	.98 *	1.59	–
	Shipping clerks	1.93	2.39	2.22	2.29	1.73	2.18	2.49
	Shipping and receiving clerks	2.18	2.18	2.36	2.34	1.92	2.05	2.31
	Truck drivers:							
	light (under 1½ tons)	1.56	2.68	2.23	2.16	1.40	2.24	2.12
	medium (1½ to and including 4 tons)	1.40	2.53	2.55	2.34	1.60	2.92	2.38
	Truckers, power (forklift)	2.00	2.30	2.30	2.32	1.94	2.42	2.25
	Truckers, power (other than forklift)	–	2.33	2.22	2.28	1.70 *	2.34 *	2.35
	Watchmen	1.25	1.80	1.96	1.89	1.44	1.67	1.90
	FEMALE JOBS, EXCEPT WHERE OTHERWISE SHOWN	**AVERAGE STRAIGHT-TIME WEEKLY EARNINGS**						
Office, Professional, and Technical Jobs	Comptometer operators	76.50	80.00	83.50	67.50	62.00	76.50	72.50
	Draftsmen, senior (men)	109.50	119.50	111.00	113.00	111.50	114.50	108.50
	Draftsmen, junior (men)	86.50	89.00	90.00	89.00	81.50	82.00	94.00
	Duplicating-machine operators	59.00	64.00	74.00	68.50	–	61.50 *	61.50 *
	Key-punch operators	77.50	74.00	79.50	68.50 *	61.00 *	68.50	65.50
	Nurses, industrial (registered)	93.50	92.00	98.00	87.00	87.00	97.00	84.00
	Office girls	50.50 *	61.50	62.50	57.50	40.50 *	52.50	49.00 *
	Payroll clerks	70.00	79.00	83.50	70.50	62.00	78.00	74.00
	Secretaries	83.00	91.00	91.50	89.00	80.50	92.50	81.00
	Stenographers, general	68.50	77.00	82.00	71.00	66.50	75.00	73.50
	Typists, class A	74.50	73.00	78.50	73.50	67.50	73.00	74.50
	Typists, class B	56.50	65.00	69.00	61.00	52.50	64.50	62.50

Indirect Wages: Climbing Coast to Coast

MORE PAY for indirect wage earners is the trend from Atlantic (Atlanta, Ga.) to Pacific (Portland, Ore.). Brave Milwaukee is no exception. Carpenters there, for example, earn 8¢ more per hour now than in 1958. Data above come from Bureau of Labor Statistics, U. S. Department of Labor. To check trends in your city (if it's not in these seven), see BLS studies reported exclusively in FACTORY for June and July 1959, June and September 1958, May and August 1957, May and August 1956.



We'll build the press for all your forging requirements . . .

Tell us your forging problems and give us your production specifications—we'll do the rest.

Erie Foundry, one of the first companies to automate forging, can provide specially designed *high volume* presses in capacities of 1000 to 8000 tons. Instead of the three machines and nine men formerly required, now you need only one Erie automated forging press and only one operator observer—to triple your present production rate! Trimming, too, can be accomplished in a single production cycle. With billet supply and finished part removal conveyorized, it is possible to achieve a production volume of, say, 1200 track-link forgings per hour.

Erie Foundry has a complete line of machines designed for high volume production of such parts as connecting rods, gear blanks, automotive and tractor valves, pinions, track links and wheel hubs.

We would like to discuss application of automated presses to your production requirements. For the complete story, phone or write Mr. R. E. Sanford, Erie Foundry Company, Erie 5, Pa.

ERIE

ERIE FOUNDRY CO.

The world's great name in forging since 1895 EF-59-01

FACTORY EQUIPMENT NEWS

For more about these items, circle numbers on Reader Service Card next to back cover.

Shop Talk 'On the Button'

Plant Manager (left): Hello, Carlson. Just got back to the office. The light on my intercom told me you'd called. What's on your mind?

Carlson (top right): Spoke with O'Brien and Garcia about the best location for our new machinery. Like you in on the final decision.

Plant Manager: Garcia and O'Brien have already called according to the "memory light" on my set. By the way, do you like this new system?

Carlson: It's great, boss. Quick and easy to operate. No delays in getting hold of other supervisors hooked up to my master set. All I do is press their particular button, pick up the handset, and talk. No operator, no switchboard.

Plant Manager: Fine. I'll call you back after talking with O'Brien and Garcia. Hello. That you O'Brien?

O'Brien (middle right): Glad you're back, sir. May I see you about this new machinery? Good thing I heard my intercom chimes ring.

Plant Manager: Wouldn't have made any difference. Your set would have "remembered" my call and advised you with the "magic eye."

O'Brien: Incidentally, I have only 12 call buttons on my set, but could use a few more. I talk to production at least 10 times a day.

Plant Manager: Okay. We can get up to 23 stations on your set, and all production is within the station-to-station 5000 ft. range.

O'Brien: What I like about this system, sir, is that no one breaks into my conversation.

Plant Manager: Save your ideas on the new machinery, O'Brien, until I talk with Garcia. Then the four of us will have a conference from your stations. I can receive up to 24 of you fellows at one time on my executive set, and you can all hear me as well as one another.

Pushes Garcia's button. No answer. Few minutes later, red light glows on executive set.

Plant Manager: Hello, Garcia.

Garcia (bottom right): Sorry I wasn't here when you called before, but my "magic eye" told me about it. How about discussing that machinery with us?

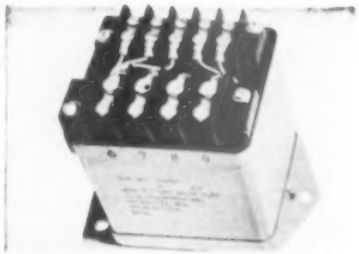
Plant Manager: Let's plan an intercom conference this afternoon. *Dictograph Products.* (Circle 103).

104—"Feutron" Liquid Filter cartridge for paint and chemical industries, uses rayon fibers of controlled denier to give precise filtering through 5 to 75 micron range. Features include long life, low pressure drop. Good where high bulk production is needed. *American Felt Co.*

105—Cafeteria Appliances, such as griddles, broilers, ranges, ovens, frying machines, are now available in 416- and 460-v. ratings. These higher voltages can reduce your installation costs. Equipment connects to standard a-c, 460-v. power source. UL approved. *Hotpoint Co.*

106—Warning Light has six powerful magnets to secure it to any steel surface. Consequently, installation on vehicles in the plant presents no difficulty. Low-cost unit revolves 360 deg. "Magna-Vac" is available for either 6- or 12-volt operation. *Trippe Mfg. Co.*

107—Voltage Booster, for motors up to 2 hp., 110 v., 20 amp, is recommended whenever voltage is consistently low due to long extension cords. Portable, low-cost unit plugs into power supply at one end, and load at receptacle end. Uses standard size cord. *Vermette Machine Co.*



108—Temperature Monitor protects a wide range of a-c applications from overheating. Responds only to actual temperature of protected equipment. This permits maximum use of equipment without danger of overheating. Rated from 110 to 550 v., 60 cycles. *Cutler-Hammer Inc.*

Turn the page

Change hats
with your maintenance man . . .

You'll find out . . .

Vertical Lift Metal-clad is safer; you can see when it's disconnected

Peace of mind means a lot when your work involves contact with thousands of volts of electricity. Ask your maintenance man which make of metal-clad gives him peace of mind, and he'll tell you G-E Vertical Lift. He can see when the primary disconnects are parted—no need to guess whether or not the breaker is safely open. And, all live parts are automatically shielded as the breaker disconnects.

Before you buy your next switchgear line-up, consider your maintenance man and the see-able peace of mind only Vertical Lift Metal-clad can give him. General Electric Company, Schenectady 5, New York. 511-32

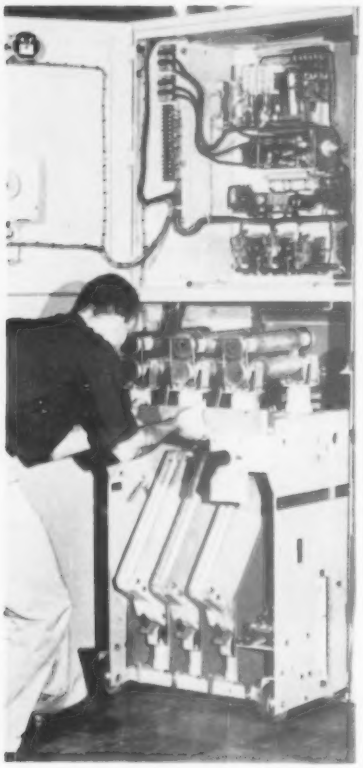
Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts Circle 507 on Reader Service Card

For more about these items, circle numbers on Reader Service Card next to back cover.

You Can Pull Its Insides Out



Here's a medium-voltage starter that's easy to install and service. It slices in half the time required to make awkward motor and power connections required on previous models. Reason: a contactor and fuse-shelf assembly that moves in or draws out on casters. Assembly, with stab-in, self-aligning contacts, rolls in and automatically plugs into de-energized power circuit. Control power is also engaged automatically.

This "Limitamp" Control provides short-circuit protection and coordinated control for squirrel-case, synchronous, and wound-rotor motors to 3000 hp., from 2300 to 4600 v. All maintenance can be done with draw-out contactor and fuse assembly in place. Contact tips are replaceable in 15 min. using magnet head wrench provided. Coils and fuses, mounted on contactor, are changed in minutes. Borrowing some features from switchgear design, this unit has automatic high-voltage barriers to protect operator. Absence of floor sills eliminates grouting and other installation costs. *General Electric Co.* (Circle 109).

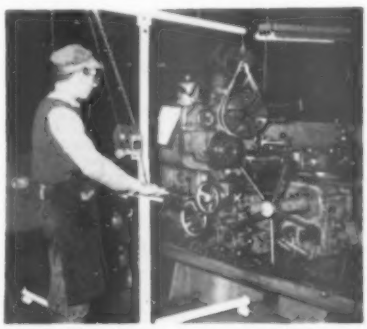
Compact Vise Converts to All-Purpose Tool

Attachments convert this 5-ton hydraulic vise into an all-purpose machine tool. You can use it as a pipe or round stock vise, pipe bender, sheet metal shear, or bar stock shear. It's also adaptable as a diagonal cutter for flat and square stock or bolt, die punch, and vise for flat stock such as wood, plastics and glass or custom molds. Works in usual position or on end.

All these attachments fasten to the primary jaw with a chamfered lock pin. Vise jaws open to 6 in. with a throat depth of 3½ in., width of 4½ in. Power unit, weighing 22 lb., is removable from vise for use as portable power jack or press. You can exert up to 10,000 lb. pressure, a pound. Nylon jaws are available for use with work that is easily damaged or scratched. *Warn Sales Co.* (Circle 110).

111—Power Channel, prefabricated, pre-engineered 5-ft. modular units, carries electrical, gas or liquid lines and communication lines. Any desired layout is possible with tees, right angles and ells. Bottom of channel has space for heavy amperage leads. *Alden Systems Co.*

112—Hose Reel, with 100 to 200 ft. capacity, is mobile on heavy-duty rubber tires. "Real-Real" is self-standing for storage when not in use. Rolls over rough floors easily. Hose, with 6-ft. hookup to connection, reels in or unwinds while water is running. *Salem Tool Co.*

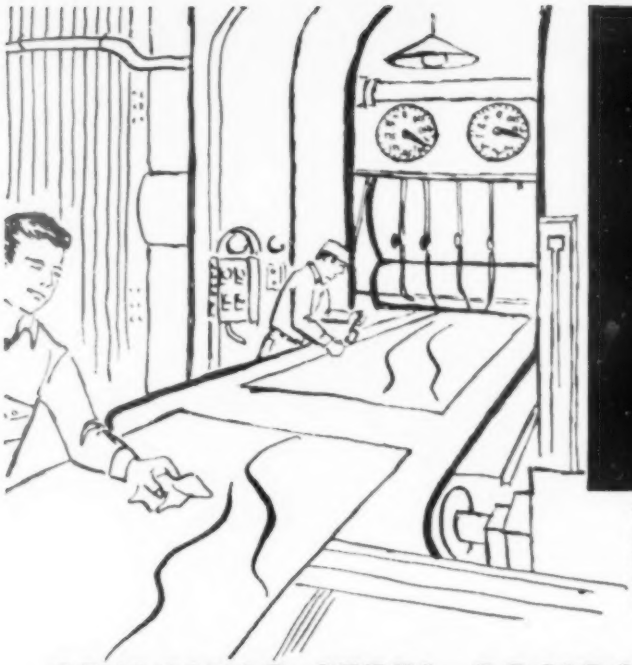


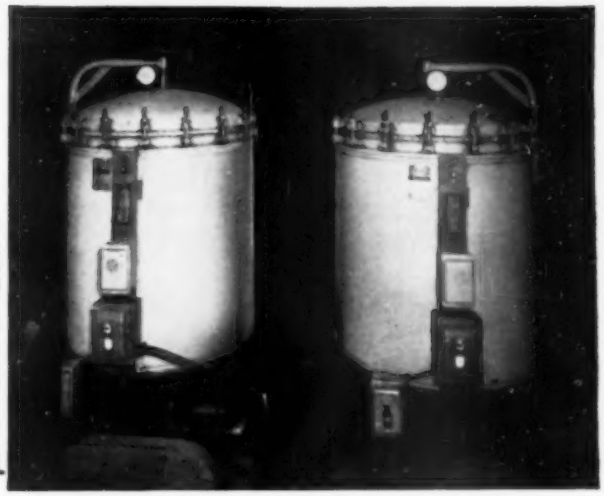
113—Hand Crane, powered by small hand-winch, transports and positions loads up to 300 lb. safely. Operator needs only 10 lb. of force to work lever handle. Mast telescopes to 9 ft. 6 in. high. Low-cost unit good for maintenance men, machine operators. *Thern Machine Co.*

114—Pipe Repair Clamp conforms to contour of pipe under high torque without biting into it. Easily and quickly fixes leaks. "Patchmaster," in ½-to-8-in. pipe sizes, 3-to-12-in. widths, withstands high clamping pressures without extruding. Corrosion resistant. *Aeroquip Corp.*

115—Emergency Light System is low-cost unit that lights instantly and automatically whenever power supply goes off. When power returns, lights turn off automatically. Four, 25-watt sealed beams, adjust in all directions. Wall or ceiling mounted. *York Lighting, Inc.*

Turn the page





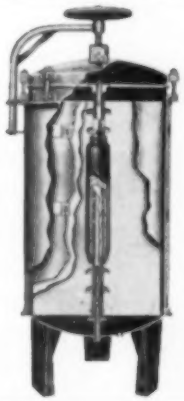
These two CFC Honan-Crane Filters remove all foreign matter from oils used on cold roll reduction mill at Crucible Steel Company of America, Park Works, Pittsburgh. One filter is for use when rolling stainless steel, the other for titanium.

CRUCIBLE STEEL COMPANY KEEPS ROLLING MILL COSTS DOWN WITH CFC HONAN-CRANE FILTERS

Crucible Steel Company of America, Park Works, Pittsburgh uses CFC Honan-Crane Filters to effect substantial savings and improved product quality. By reducing downtime over 25%, they have increased productive man-hours accordingly. Rolling Oil savings have also resulted.

The CFC Honan-Crane "C" Type Filter uses a combination of filter media — inert cellulose and Cranite (fuller's earth). The cellulose filters out solid contaminants while Cranite removes the products of oil deterioration such as acids and asphaltenes. (Cranite also removes all traces of stain from the finished Crucible steel or titanium sheets.)

CFC Filtration Equipment provides positive protection against all types of oil contamination — for engine lube oils, quench oils, hydraulic oils, fuel oils, roll oils, cutting oils, turbine oils. For technical literature, write to Dept. FA



COMMERCIAL FILTERS CORPORATION
MELROSE 76, MASSACHUSETTS
PLANTS IN MELROSE, MASSACHUSETTS AND LEBANON, INDIANA

MICRO-CLARITY AT MINIMUM COST

Fulflo FILTERS — *with genuine Honeycomb Filter Tubes for controlled micro-clarity of industrial fluids.*

CFC FILTERS — *Selective filtration of oils • water-oil separators • magnetic separators • pre-coat filters • coolant clarifiers • automatic tubular conveyors.*

For more about these items, circle numbers on Reader Service Card next to back cover.

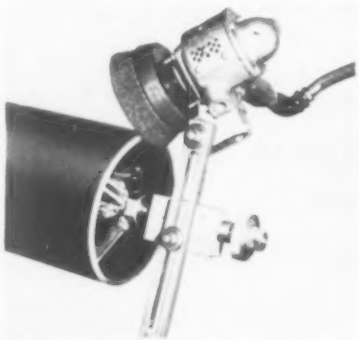
116—Floor Scrubber features multi-sectioned brush that conforms to surface irregularities automatically. Scrubs out shallow spots, over bumps. Electrically reversible motor and brush can be moved up or down to vary pressure. *Nobles Engineering & Mfg. Co.*

117—Battery Charge Control unit eliminates danger of overcharging, yet insures full state of charge before automatically cutting out. Controls both daily and weekly equalizing charges. Works with modified constant potential-type chargers. *Electric Storage Battery Co.*

118—Liquid Oxygen Manifold, accommodating 4 type LC-3 cylinders, provides uninterrupted supply of 12,000 cu. ft. of oxygen. Can replace existing systems of 48 conventional high-pressure cylinders. Changes automatically from one bank to another. *Union Carbide Corp.*

119—Torque-Sensitive Drive requires no critical skill for manual-feed small hole drilling or reaming. An over-rolling-type adjustable clutch disengages tool when breakage is imminent. Fits standard machine spindles, drill chucks. Various torques possible. *Scully-Jones & Co.*

120—Circulating Fan draws in accumulated heated air from ceilings and recirculates it downward to floor. Reduces load on building heating systems. Revolving discharge prevents hot spots or blockage of flow by machines. In 6000 to 25,000 cfm. capacities. *L. J. Wing Mfg. Co.*

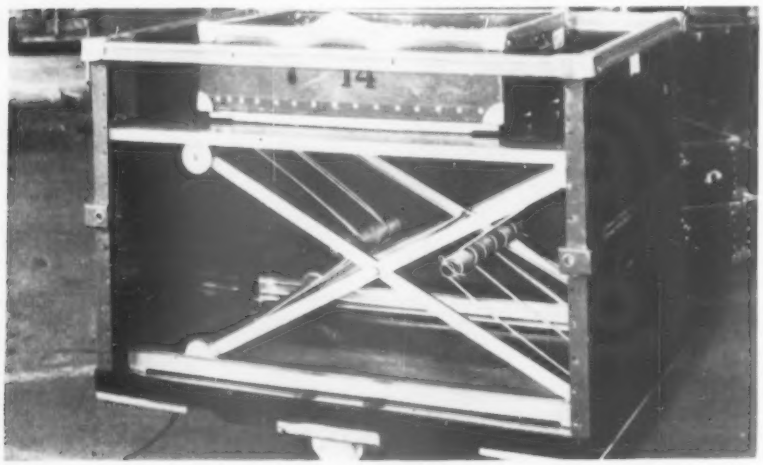


121—"Bev-L-Grinder" accurately prepares 6-to 18-in. pipe for welding on-the-spot. Doesn't change physical properties of metal. Grinding head rotates freely on 20 to 90 deg. angle. Simple to use, fast, one-hand control. Powered by 6000-rpm. air motor. *E. H. Wachs Co.*

122—Electric Crane, pedestal-mounted, positions loads to within 0.008 in. Requires only 5 sq. ft. for installation, but serves more than 2150 sq. ft. of floor space. Minimum capacity 6 tons. For use especially in crowded areas of plants. *R. G. LeTourneau, Inc.*

123—Portable Nibbler, with self-oiling lubricator, cuts 10-gage mild steel, 8-gage stainless steel in straight or curved lines without distorting material. Comes in models for cutting wire, wire cloth, plastics, corrugated material, brass, sheet metal. *Modern Mfg. Co.*

124—Vertical Conveyor, index-type, automatically receives, spaces, transports, and discharges up to 20 cases per min. Handles two packages up to 15½x15½x36 in., and up to 180 lb. per carrier at vertical speed of 90 fpm. Occupies little space. *Alvey Conveyor Mfg. Co.*



Ends Bending Fatigue

Hand truck with "floating bottom" keeps contents continually at waist level for fast loading and unloading. Workers pick up material from truck top without bending over for objects near bottom. Reduces operator fatigue and chance of personal injuries. "Unilevel" truck bottom, supported by torsion springs, moves up or down depending on weight of load. No matter how weight is distributed, bottom remains level and in constant alignment. Loads to 450 lb. *National Vulcanized Fibre Co.* (Circle 125).

Turn the page

Hold that pipe line!

To hold this pipe securely in place—to tie it down so it is safe to haul—takes experience, a little engineering, and some powerful holding. Flat, tensional steel strapping does it...does it better and at less cost than anything else. This is one reason why the use of steel strapping continues to increase. Other reasons are that Signode offers the right kind of strapping and knows the right method for every type of shipment...there are hand tools, power tools and automatic machines to apply it, and test facilities at Signode to find out in advance how your product will behave in transit. For more information, call the Signode man near you, or write:

First in steel strapping

SIGNODE STEEL STRAPPING CO.

2663 N. Western Avenue, Chicago 47, Illinois

Offices Coast to Coast. Foreign Subsidiaries and Distributors World-Wide

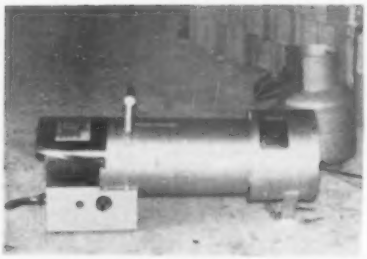
In Canada: Canadian Steel Strapping Co., Ltd., Montreal • Toronto

For more facts Circle 509 on Reader Service Card

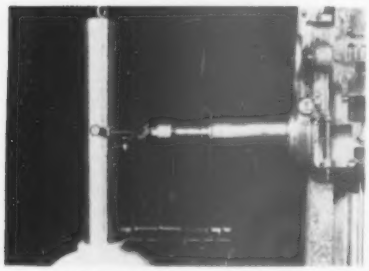
For more about these items, circle numbers on Reader Service Card next to back cover.

126—Motorized Pry Bar, weighing 110 lb., is efficient answer to close quarter load-handling problems. One-man operated, it moves machinery or crates (up to 7 tons) into tight, little-used areas in warehouse. "Tug-Bar" plugs into 110-v. a-c outlet. *Western Gear Corp.*

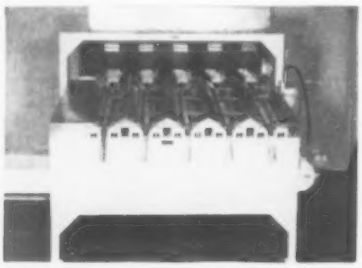
127—Flasher Light device converts obsolete battery-operated lantern or flasher (with mechanical make and break) into modern unit. Carries lifetime guarantee. Transistorized incandescent circuit is encased in plastic container. Quick installation. *Pacific Mercury Mfg. Corp.*



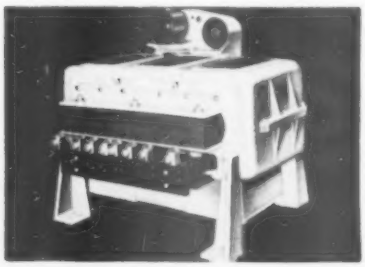
128—Portable Space Heater burns LP-gas to produce 200,000 Btu. for maintenance shops, warehouses, welding shops, shipping platforms. Also pre-heats truck engines. Fan circulates 2000 cu. ft. air per min. Should power fail, fuel is automatically turned off. *Stow Mfg. Co.*



129—"Tru-Plumb" Tool measures vertical alignment of machine tools to accuracy of 0.0002 in. per foot of length. Large 17 in. base minimizes problem of irregular table surface. In 36 to 60 in. heights. For headstocks, end supports, etc. *Giddings & Lewis Machine Tool Co.*

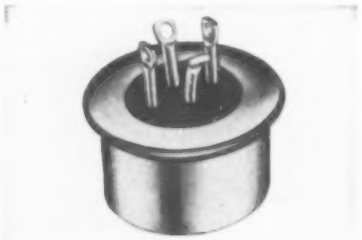


130—Multiple High-Speed Sorter processes dowel pins, nuts, bushings, studs, taper pins, etc., up to 1 in. in thickness or diameter at rate of 7000 to 12,000 pieces per min. Basic unit has 5 sorting rollers, 2 conveyors. More rollers can be provided. *U. S. Engineering Co.*



131—Variable Transformer, with re-entry rings and helical coils, permits continuously adjustable control of 1600 increments from zero to maximum output. Two types: 270 v., 200 amp., 93.5 kva. convection cooled; 360 amp., 168 kva., air-cooled. *Superior Electric Co.*

132—Cleanliness Tester numerically records amount of non-bonded soil on surface. Optical density of dirt is measured on microscope slide. Tests smut residue after steel pickling; cold mill detergents and oils; annealing surface performance. *Branson Ultrasonic Corp.*

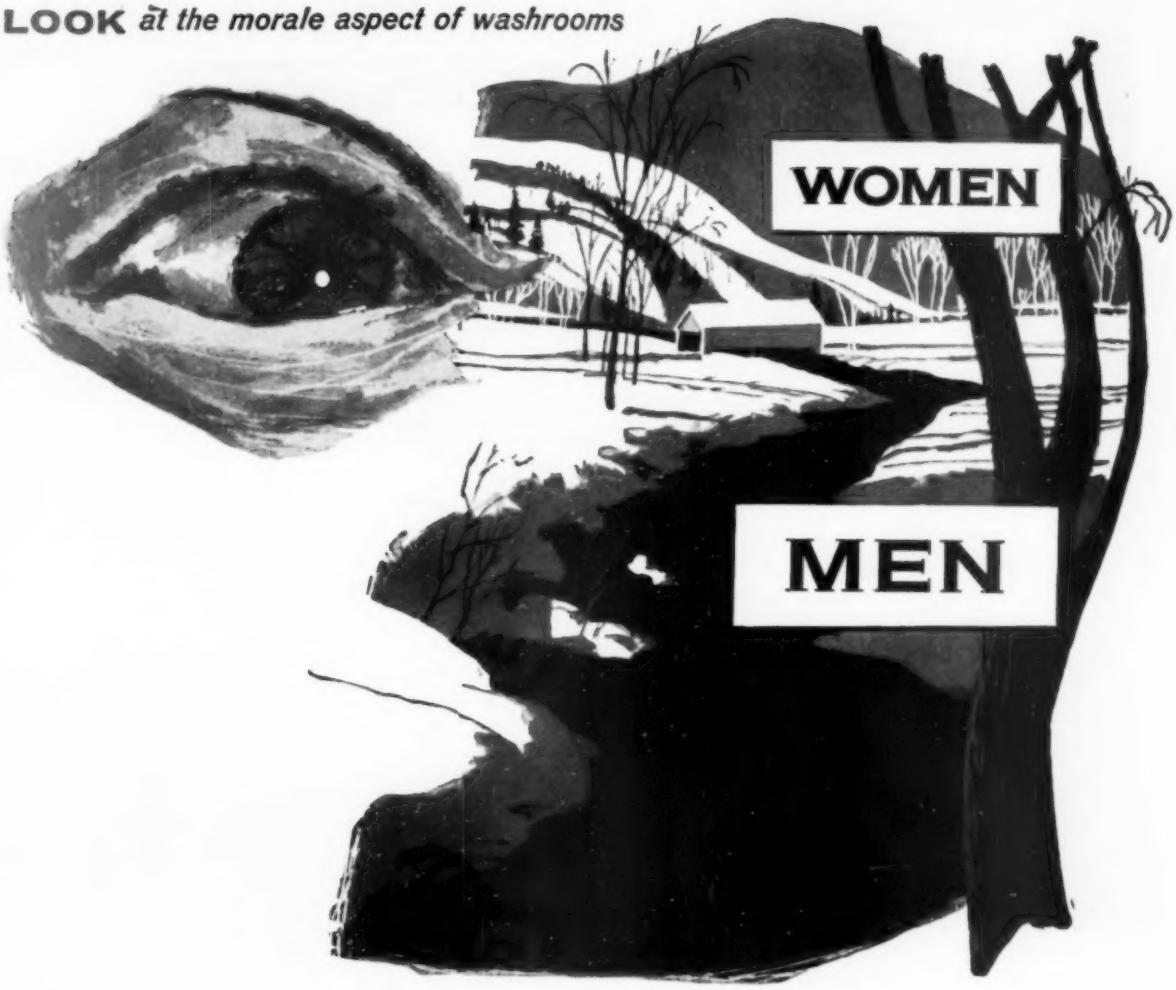


133—Hermetically-Sealed Thermostat is a 3-phase precision unit for wye-connected circuits. Actuated by snap-acting, bimetal discs. Fixed temperature set within −65 to +300 deg. range. Operates on 115/208 v. a-c, 60-400 cps. Basic unit weighs 1 oz. *Texas Instruments Inc.*

134—Utility Vehicle for running around plant looks like wartime jeep, but is only half the size. "Bug" carries ¼-ton payload, is powered by 35 hp., 4-cyl. gas engine. Has 3-speeds, hydraulic clutch, 4:65 rear axle ratio. Price $1350 f.o.b. *Crofton Marine Engine Co.*

Turn the page

LOOK *at the morale aspect of washrooms*



"HEALTHY" FRESHNESS

A clean, fresh atmosphere in washrooms pleases everyone. Makes washrooms "feel" clean. Reflects management concern for individual health and welfare.

This kind of freshness is easily maintained with modern automatic West deodorizers that contain a pleasantly perfumed aromatic fluid. These modern devices are neatly encased in white plastic. They are loaned, installed and maintained free of charge — as part of the WEST WASHROOM SANITATION PROGRAM.

The WEST WASHROOM SANITATION PROGRAM includes heavy-duty cleaners and disinfectants for facilities at regular intervals. Cleaners prevent drain clogging from salt buildup. Disinfectants kill micro-organisms that cause T.B., Polio, Typhoid, Influenza and other diseases.

Important too, the WEST PROGRAM gains the support of custodians so that they maintain high standards of sanitation.

The WEST WASHROOM SANITATION PROGRAM often saves enough to pay for itself. It includes an analysis of materials and methods that simplifies maintenance and leads to savings in towels, soap and other supplies. For full details, phone your nearby West office. Or mail the coupon to our Long Island City headquarters, Dept. 14.

☐ Send information on your WASHROOM PROGRAM.

☐ Have a Specialist phone for an appointment.

Name _____

Position _____

PROGRAMS AND SPECIALTIES
FOR PROTECTIVE SANITATION
AND PREVENTIVE MAINTENANCE

WEST CHEMICAL PRODUCTS INC.

WEST DISINFECTING DIVISION

WEST CHEMICAL PRODUCTS INC.
42-16 West Street, Long Island City 1, New York
Branches in principal cities
CANADA: 5621-23 Casgrain Avenue, Montreal

For more facts Circle 510 on Reader Service Card

FLEXIDYNE
The Dry Fluid Drive
New soft starts . . . overload protection.

DODGE PARA-FLEX
The Flexible Cushion Coupling
with the 4-way flex!

ROLLING GRIP
FRICTION CLUTCHES
Positive! Smooth! No Toggles!

•

Write for Bulletins!

- ✓ Flexidyne Drives & Couplings.
- ✓ Para-flex Couplings—data.
- ✓ Rolling Grip Clutches—data.

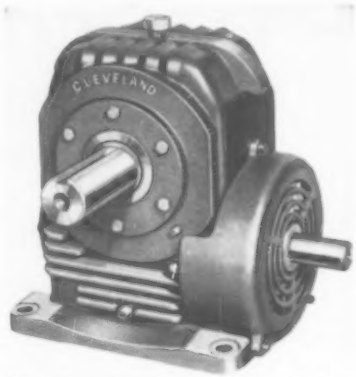
DODGE MANUFACTURING CORPORATION
400 Union Street • Mishawaka, Indiana

DODGE
of Mishawaka, Ind.

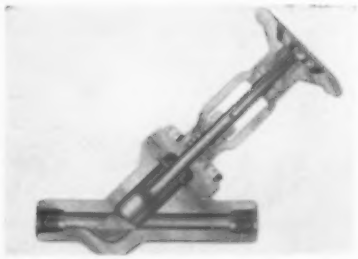
For more about these items, circle numbers on Reader Service Card next to back cover.

135—Mobile Air-Power Unit is low-cost source of compressed air for lubrication, spray painting, fumigating, disinfecting. Tank holds 7½ gal. at 60/80 psi. Powered by ⅓- or ½-hp. motor. Choice of accessories includes control equipment. *Campbell-Hausfeld Co.*

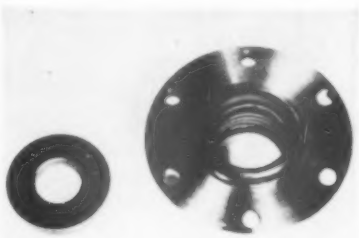
136—Compensating Flue System has self-balancing twin dampers that simultaneously control flue outlet and air inlets. For blast-fired gas furnaces. Requires no special ductwork. Supplies 10 cu. ft. of air for each 1000 Btu. of fuel. *Eclipse Fuel Engineering Co.*



137—Speed Reducer, 1 to 40 hp., has cooling fan mounted on input end of worm shaft. Rotates in either direction. Worms and gears resist wear, and pitting. No need to replace worms and gears in sets; replacements work with existing parts. *Cleveland Worm & Gear Co.*



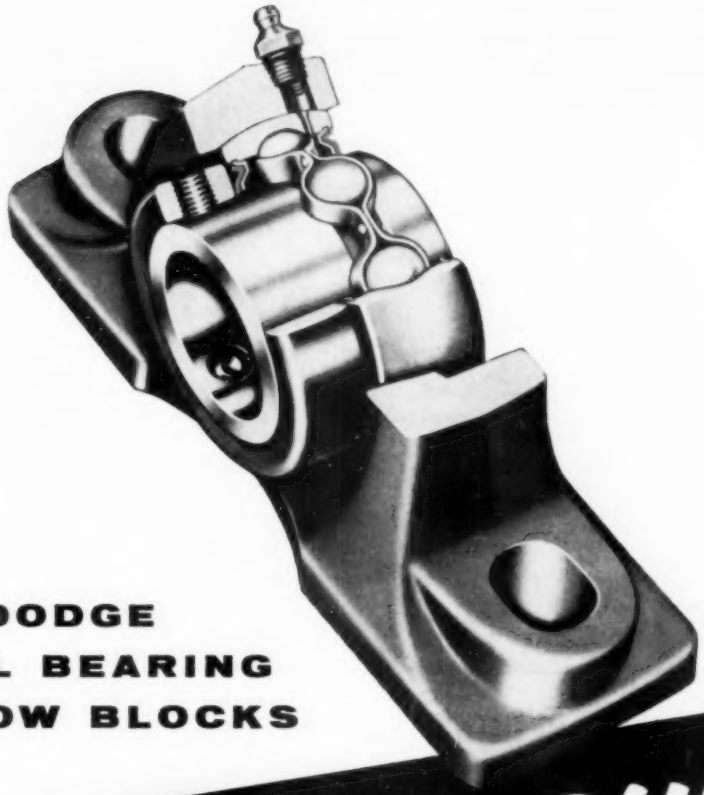
138—Control Valve permits flow to move in straight line at all throttling positions. Boosts capacity of some systems to 20% without changing pipe dimensions or increasing pressure. Pressure ratings from 600 to 10,000 psi; sizes ⅛ to 4 in. *General-American Valve Co.*



139—Mechanical Shaft Seal, for rotating machinery systems, resists most corrosive liquids and gases. Withstands pressures to 1000 psi., temperatures from −400 to +1000 F. Provides leakproof sealing of hazardous fluids. Sizes to 7-in. shaft diameters. *Turbocraft, Inc.*

140—Portable Space Heater works on same principle as residential-type oil burner. Has two entirely separate air sources: one to support combustion, second (atop heater) for heated air circulation. Built-in thermostat. Uses kerosene or No. 1 fuel oil. *Champion Heater Co.*

Turn the page



DODGE
BALL BEARING
PILLOW BLOCKS

PRECISION BUILT
– for normal and medium duty jobs

SC

NORMAL DUTY
SHAFT SIZES — 1/2" to 2-7/16"

SCM

MEDIUM DUTY
SHAFT SIZES — 1-7/16" to 3-1/2"

CALL THE TRANSMISSIONEER—your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods. Look in the *white* pages of your telephone directory for "Dodge Transmissioneer."

- ★ High quality at moderate cost.
- ★ Deep groove ball bearing provides high radial and thrust capacity.
- ★ Long inner race distributes load over greater shaft area.
- ★ Metal backed synthetic seals are locked in position. They can't blow. Effectively exclude dust and dirt.
- ★ Completely sealed both on and off the shaft.
- ★ Fully self-aligning.
- ★ Rugged one-piece semisteel outer housing.

Pillow blocks, flange bearings, piloted flange bearings, cylindrical units, hanger bearings, screw conveyor hanger bearings.
Call your local Dodge distributor — or write us for technical bulletin.

DODGE MANUFACTURING CORPORATION, 400 Union St., Mishawaka, Ind.

DODGE
of Mishawaka, Ind.

protects its operators in process areas with BLONDER-TONGUE CLOSED CIRCUIT TV

Institute, West Va.—The Union Carbide Chemicals plant here uses a Blonder-Tongue "Observer" two-camera installation to enable the control room operator to watch other operators in hazardous process areas.

The operators take samples of materials from pumps and tanks within the structure. Both "Observer" cameras, one at ground level, and one at a 60 foot elevation, are installed in special vapor-proof housings.

This use of closed circuit TV, which extends man's visual range to cover hazardous areas of operation, is just one of many of its applications. Throughout industry . . . in steel mills, pulp mills, power plants, food plants and nearly every expanding industry . . . alert management is constantly finding new uses for closed circuit TV in cutting costs and increasing efficiency and safety. Blonder-Tongue installations are serving this purpose at such companies as the following: DuPont; General Motors; Youngstown Sheet; Johnson & Johnson; Goodyear; Southwestern Portland Cement Company; Albert Einstein Medical Center; Public Service of New Jersey; Industrial Forge and Steel; Sharon Steel; Burns Brick Co.; Brunswick Pulp and Paper Company; Douglas Aircraft; and many others.

Blonder-Tongue and its nationwide staff of specialists offer you a free survey to demonstrate where and how industrial television will benefit you, what an installation involves, and its cost. You can't afford to miss this opportunity to find out (at no risk, no obligation) what industrial TV can do for you. Wire, phone or write today for a free survey.

BLONDER-TONGUE LABORATORIES, INC.

9 Alling St., Newark 2, New Jersey

hi-fi components • UHF converters • master TV systems • industrial TV cameras • FM/AM radios

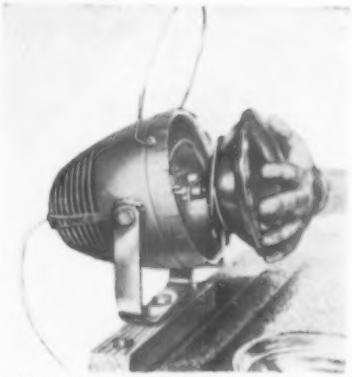
In Canada: Telequipment Manufacturing Co. Ltd., London, Ont.
Export: Morhan Export Corp., N. Y. 13, N. Y.

A completely automatic Blonder-Tongue industrial TV system (compact, rugged camera; automatic light compensator; TV monitor) providing quality pictures can be installed for less than $2,500.

FACTORY / EQUIPMENT NEWS

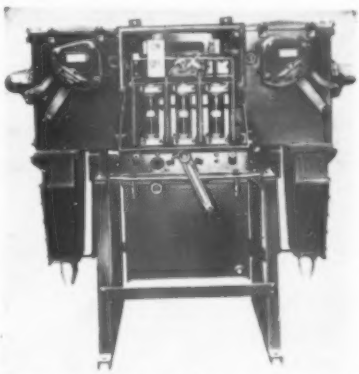
Begins on page 106

For more about these items, circle item numbers on Reader Service Card next to back cover.



141—Outdoor Floodlights have coil spring cradle for lamp to absorb vibration, shock or pole-whip. Lamp pops out for quick replacement without tools. New lamp, to 300 watt, 2000 hr., snaps into place. Weather- and corrosion-proof. *Stonco Electric Products Co.*

142—"Add-A-Tester" plug-in adapters extend Type 260 volt-ohm milliammeter usage. Four of 7 adapters, all under $40, are a transistor tester, a d-c VTVM (½ to 500 v.), temperature tester (−50 to +250 deg.), a-c ammeter (¼ to 25 amp.). *Simpson Electric Co.*



143—Fused Load-Breaking Switch, 15 kv. outdoor-type, prevents single-phasing of protected equipment. Interrupting capacity of 250 mva. at 13.8 kv. Safety features include an interlock to keep top covers from opening when switch is in "closed" position. *Electro-Machinery Corp.*

Turn the page

titeflex flexible hose and fittings handle any fluid under any condition

Full lines to match today's higher temperatures and pressures . . . more corrosive fluids . . . tougher requirements.

titeflex

TITEFLEX flexible hose and fittings can really take it. From end to end, inside and out, made *right* in our own plant with complete quality control. You benefit because TITEFLEX offers *extra* safety, flexibility, strength and dependability. Applications? You name it, Titeflex solves the tough ones. That's why more and more companies are finding it pays to get in touch with TITEFLEX. Call your TITEFLEX Distributor (in the Yellow Pages) or contact us direct.

1 FLEXIBLE METAL AND TEFLON HOSE WITH "ZERO-MOTION" BRAID—AIR, HYDRAULIC, LIQUID

2 "FINGER-FLEXIBLE" TEFLON* HOSE IN DIAMETERS TO 2"

3 BULK HOSE WITH REUSABLE FITTINGS

4 HOSE ASSEMBLIES—FACTORY ASSEMBLED

5 STANDARD AND SPECIAL CONNECTIONS

6 QUICK-SEAL COUPLINGS —HIGHER THE PRESSURE, TIGHTER THE SEAL

*Trademark of duPont

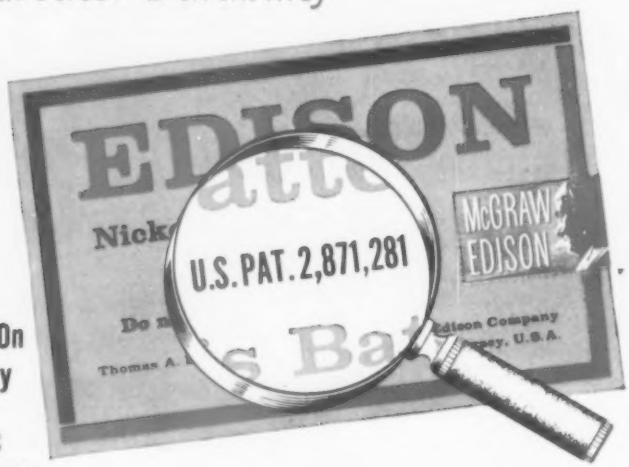
titeflex inc. springfield mass. PACIFIC DIVISION • SANTA MONICA • CALIFORNIA

For more facts Circle 514 on Reader Service Card

What you—as a Battery User—
Should know about

U.S. PATENT 2,871,281

New Active Material Gives EDISON
Even Longer Life
Even Greater Durability



This Label On Your Battery

Means This in Performance

1. Longer life—lower depreciation
2. Reduces maintenance cost
3. Durable—no sudden failures
4. Full shift performance
5. Fully automatic charging
6. No corrosive fumes
7. Lowers cost of truck operation
8. Can stand idle indefinitely
9. Withstands temperature extremes
10. Other uses after heavy duty life
11. Lighter weight
12. Edison Nationwide Service

Now EDISON, the only battery originally developed exclusively for electric trucks, *again leads the field* with a new patented active material that means *longer life* and *greater durability*. Tested exhaustively in the laboratory . . . proven, *under torturous conditions*, in the field . . . this new development in active material reduces your annual battery cost to an even lower level and protects the battery against damage caused by excessive overcharging and overdischarging.

EDISON's free book about this remarkable development is a "must" for battery users. Write Storage Battery Division, Thomas A. Edison Industries, West Orange, N. J.

EDISON—The Higher-Priced Battery that Costs Less

EDISON NICKEL-ALKALINE STORAGE BATTERIES

Another Product of McGRAW EDISON

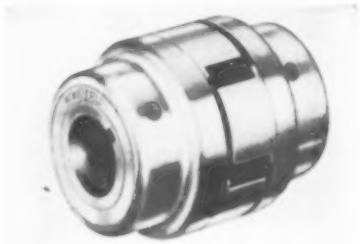
FACTORY / EQUIPMENT NEWS

Begins on page 106

For more about these items, circle item numbers on Reader Service Card next to back cover.

144—Automatic Batching Controller eliminates manual adjustment of weight selectors for desired quantity of each ingredient. "Batchboard," containing pre-set formula, is inserted into receptacle on control panel. Unlimited number of formulas possible. *Toledo Scale Corp.*

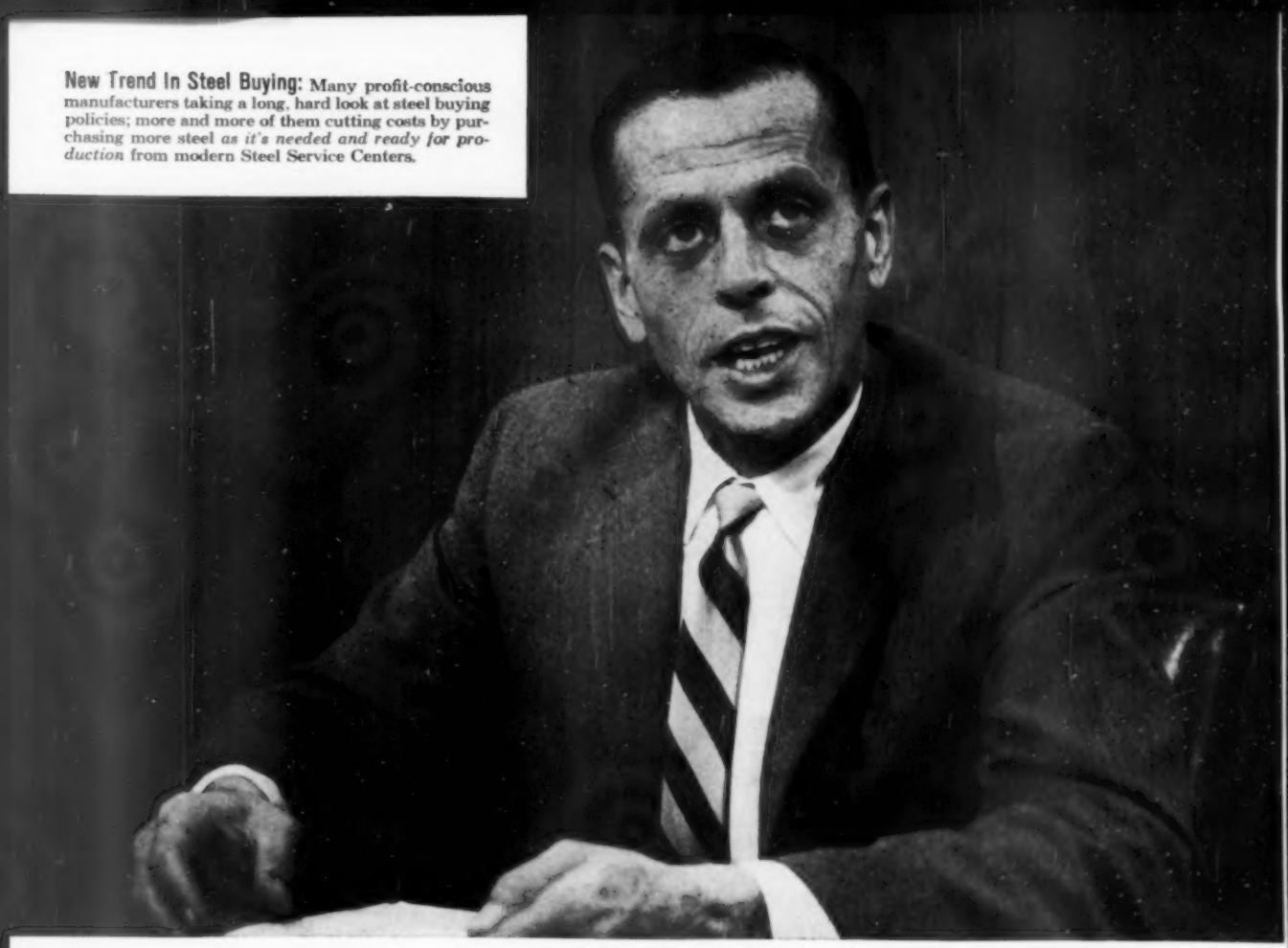
145—Infrared Heater pinpoints heat directly on operator or object in problem areas such as warehouses, cargo handling areas. Eliminates costly heating of entire building. Immune to thermal shock; weatherproof; 110, 208 and 230 v. capacity. *Wiggin Products Co.*



146—Insulated Drive Coupling, with non-conducting insert, eliminates static and dynamic electricity. Absorbs shock, torsional vibration. In 6 sizes, bores from ¼ to 1½ in. Non-corrosive, weighs from 5 oz. to 2 lb. Transmits up to 10 hp. at 1800 rpm. *Charles Bond Co.*

Turn the page

New Trend In Steel Buying: Many profit-conscious manufacturers taking a long, hard look at steel buying policies; more and more of them cutting costs by purchasing more steel *as it's needed and ready for production* from modern Steel Service Centers.



"We've cut delivery time 75%"

says Mr. W. M. Croft, California Drop Forge Company, Los Angeles, California

"U. S. Steel Supply's prompt deliveries help us keep this drop forge hammer busy."

"Our normal delivery time used to be four or five weeks," says Mr. Croft. "Now, we offer 7-day delivery on orders, when necessary, because we're able to get the material we need from U. S. Steel Supply on an overnight basis.

"Recently, we faced this situation: One of our aircraft customers, through an accident, lost 65 parts from a 200-unit order; he notified us immediately, and we, in turn, called U. S. Steel Supply for the material. It arrived the next day, and a week later the re-order was completed. Our customer was impressed!"

Why not take a close look at *your* steel buying policies—you'll find U. S. Steel Supply's booklet entitled "Value Analysis at Work" very helpful. Write to our Chicago Office, or call your nearest U. S. Steel Supply Steel Service Center. You'll find us in the Yellow Pages listed under *steel*.

USS is a registered trademark

"On one day's notice, U. S. Steel Supply furnished us with 80,000 pounds of hot rolled bars," says Mr. J. F. Armitstead, Shop Superintendent.

U.S. Steel Supply Division of USS United States Steel

Steel Service Centers and Complete Steel Strapping Service at: Baltimore, Birmingham, Boston, Chicago, Moline, Cleveland, Houston, Dallas, Los Angeles, Milwaukee, Newark, Southington (Conn.), Philadelphia, Seattle, Portland (Ore.), Pittsburgh, St. Louis, St. Paul, San Francisco. General Offices: 208 South La Salle Street, Chicago 4, Ill.

For more facts Circle 516 on Reader Service Card

CHAMPION
of the four major brands of lamps
CHAMPION stands out for VALUE
The last analysis . . . the cost of light . . . is the first concern of Champion . . . where no lamp leaves unless it meets the highest value standards in the industry.
Champion Lamp Works, Lynn, Mass.
CHAMPION Lamps
Incandescent
Fluorescent
Your best buy in lamps

FACTORY / EQUIPMENT NEWS

Begins on page 106

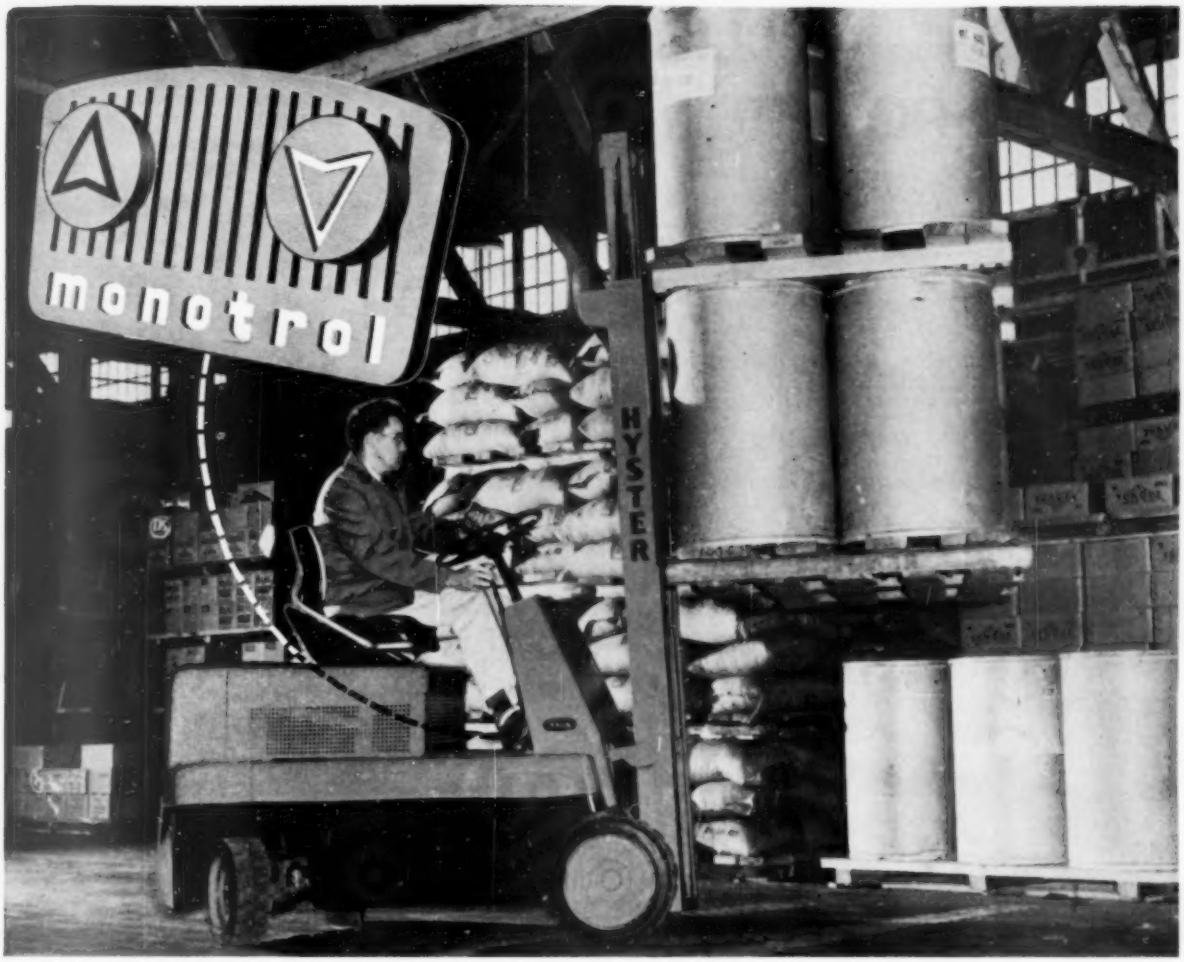
For more about these items, circle item numbers on Reader Service Card next to back cover.

147—Metallizing Gun, 4½ lb., handles all metals from molybdenum to lead. Heavy-duty, high-precision unit operates on all combustible gases, consuming about 21 cu. ft. air per min. Uses wire sizes from 15 B&S to $^{3}/_{16}$ in. Self-adjusting air cap. *SpraRod Corp.*

148—Closed-Circuit TV line offers five cameras, two monitors. Monitor with 21-in. screen receives both closed-circuit and regular broadcast signals. Also comes in 14-in. screen, closed-circuit. Choice of mounting, optical, and distribution accessories. *Motorola, Inc.*

149—Distribution Center is small, light, and 16 db. quieter than NEMA standards for transformers of 75- to 225-kva. ratings. Combines incoming line switch and fusing, transformer, and outgoing feeder breakers into integral unit. To 4800 v. *General Electric Co.*

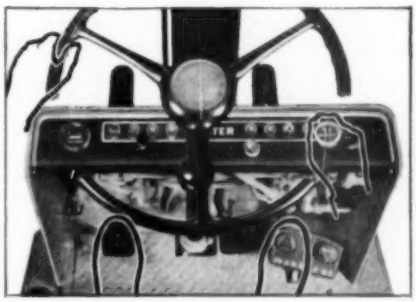
Turn the page



Announced in June—

Hyster **monotrol** *trucks are already at work in warehouses and industrial plants from coast to coast.*

Acceptance of the new Hyster SpaceSaver 3,000, 4,000 and 5,000 lb. trucks with *Monotrol* control system is even exceeding earlier expectations. In warehouses and industrial plants from coast to coast the new Monotrol trucks are setting new standards of production, safety, and handling economy. The ease of moving more tonnage with less operator effort and greater safety is the story being told by each new owner. Contact your Hyster dealer for a demonstration or write to Hyster Company, P. O. Box 847, Danville, Illinois, for the illustrated brochure.



What is Monotrol? It is a revolutionary control system that frees the operator's hands for full-time steering and load control. A single *right* foot pedal controls forward-reverse and speed. A left foot pedal controls precision inching. Push-buttons control automatic parking brake and transmission engagement for complete safety.

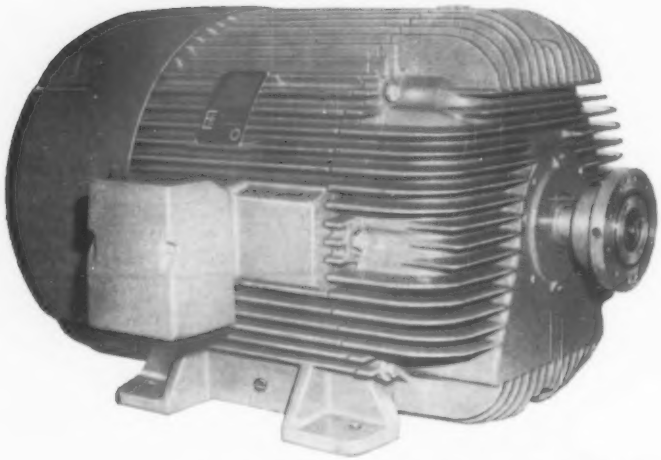
HYSTER COMPANY
INDUSTRIAL TRUCK DIVISION

Factories: Portland, Ore. • Danville, Ill. • Peoria, Ill. • Kewanee, Ill. • Nijmegen, The Netherlands • Glasgow, Scotland • Sao Paulo, Brazil • Sydney, Australia (licensee)

For more facts Circle 518 on Reader Service Card

ELLIOTT C-W SEALEDPOWER MOTORS

This new 300-hp unit is the largest of the Elliott C-W "family" of ribbed-frame enclosed motors, pioneered in the United States by Crocker-Wheeler.



BEST FOR YOUR TOUGHEST JOBS BECAUSE THEY ARE BETTER COOLED BETTER PROTECTED BETTER BUILT

IMPORTANT FACTS are given in new Elliott Bulletin PB 6000-2. Send for free copy now.

ELLIOTT Company

Crocker-Wheeler Plant • Jeannette, Pa.

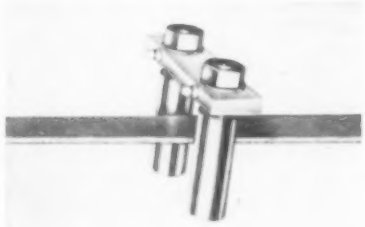
WB-5

FACTORY / EQUIPMENT NEWS

Begins on page 106

For more about these items, circle item numbers on Reader Service Card next to back cover.

150—Quick-Hose Connector automatically stops air flow and disconnects hose with one motion of operator's hand. No need to turn off valve. Hose will not whip or chase operator. Handles gas or liquid to 4000 psi. Burst pressure: 20,000 psi. *Besler Corp.*



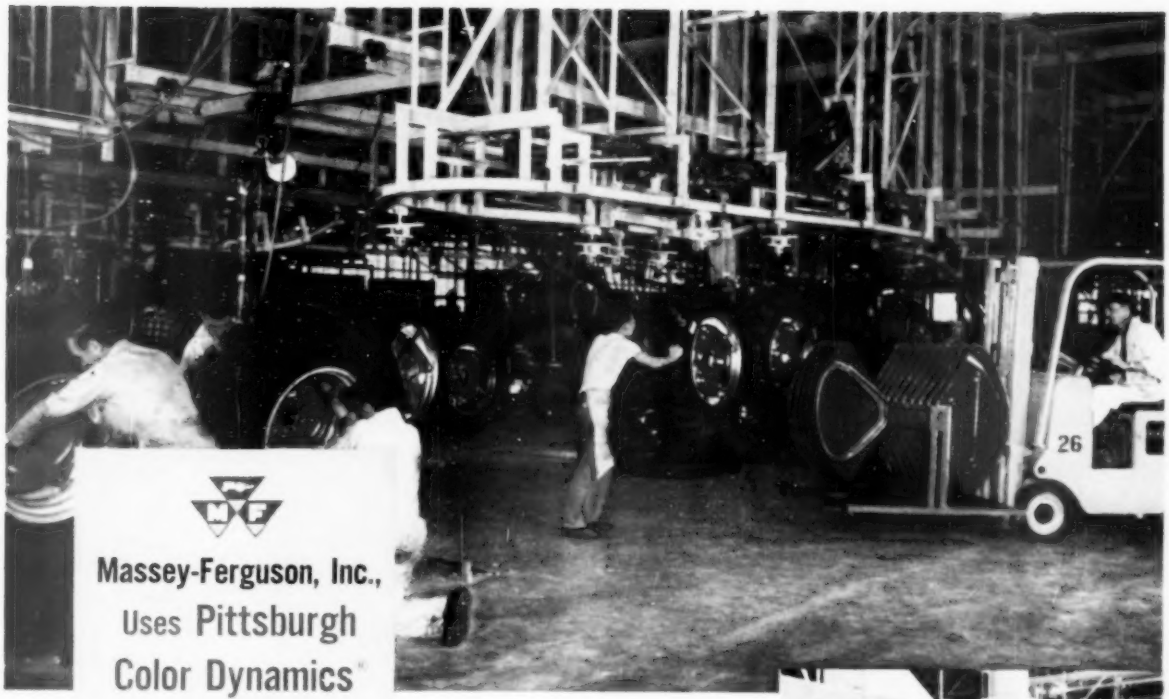
151—Belt Guide Roller saves power by reducing slippage, thus increasing belt life. Can be used at high belt speeds. Operates 20,000 hours without lubrication. Consists of roller and ball-bearing in sleeve. Bearings are line- and dirt-sealed. *SKF Industries, Inc.*

152—Overload Safety Control for conveyors responds to slight tug on trolley hanger. For any type conveyor with electric motor drive. Predetermined safety shut-off point is set on ammeter. If line pull exceeds this, conveyor motor shuts off. *American MonoRail Co.*

Turn the page

For more facts Circle 519 on Reader Service Card

For more facts Circle 520 on Reader Service Card ➤



Massey-Ferguson, Inc., Uses Pittsburgh Color Dynamics®

to improve productive efficiency, and safety in huge Detroit tractor assembly plant

Another leading example of the way Pittsburgh COLOR DYNAMICS improves productivity and welfare of workers is the enlarged Detroit plant of Massey-Ferguson, Inc., world-famous builder of tractors and combines.

● **This modern system** of painting was included in the $3,500,000 expansion program which tripled capacity and made this one of the world's largest tractor assembly plants. All Massey-Ferguson tractor engineering and assembly operations for North America are now concentrated here.

● **Interior** of the enlarged and modernized Detroit assembly plant was painted according to COLOR DYNAMICS principles. Colors for walls and ceilings were selected to raise the light level of all work areas. Overhead distractions were subdued. Safety colors were used on operating controls, mobile equipment and traffic lanes.

● **Massey-Ferguson's satisfaction** with the results of COLOR DYNAMICS is expressed by J. L. Gilliam, General Factory Manager of the Detroit assembly plant. "Our experience," he states, "convinces us there are dollars-and-cents advantages in this purposeful use of color. It has materially improved the productive efficiency and safety of our workers.

● **"Moreover,** improvement in the general appearance of our plant has enhanced morale. Being proud of their cheerful surroundings, our employees strive to keep them clean. This simplifies housekeeping. And we enjoy these benefits of COLOR DYNAMICS without paying more than we would for conventional maintenance painting."

● **Why not see** what COLOR DYNAMICS can do in your plant? Try it on a machine or two, or in a whole department and see the difference in efficiency, morale and safety.

You Can Have a Color Program for Your Plant—FREE

● Send for our comprehensive fully illustrated book which explains simply and clearly the principles of COLOR DYNAMICS and how to use them effectively. It's FREE. Better still, we'll prepare a detailed color program for your plant, or any part of it, without cost or obligation. Just call your nearest Pittsburgh Plate Glass Company branch and arrange to have a representative see you. Or mail coupon at right.

Featured on the Garry Moore Show—CBS-TV Tuesday evenings.

PITTSBURGH PAINTS

PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

IN CANADA: CANADIAN PITTSBURGH INDUSTRIES LIMITED

Send for a Copy of this FREE Book

Pittsburgh Plate Glass Co., Paint Div.,
Department FMM-109, Pittsburgh 22, Pa.

☐ Please send me a FREE copy of your booklet "COLOR DYNAMICS."

☐ Please have your representative call for a COLOR DYNAMICS survey without obligation on our part.

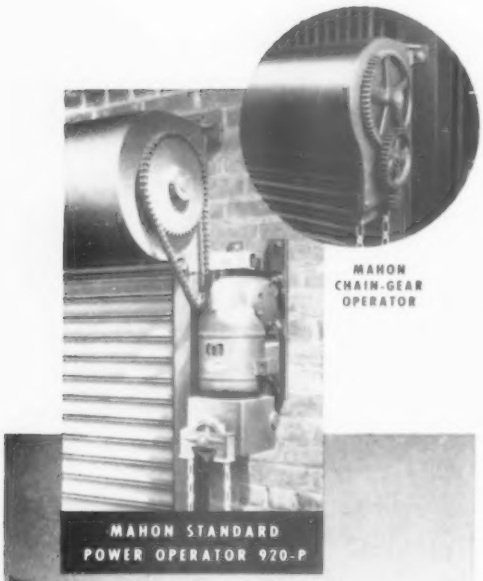
Name _____

Street _____

City _____ County _____ State _____

ROLLING STEEL DOORS

Manually, Mechanically, or Electrically Operated



MAHON CHAIN-GEAR OPERATOR

MAHON STANDARD POWER OPERATOR 920-P

Here is another Rolling Steel Door application in which operating space, protection against intrusion, and fire safety were prime factors in the selection of doors for an all-metal building which houses large units of road building and road maintenance equipment.

The vertical roll-up action of Mahon Rolling Steel Doors requires no usable space either inside or outside the opening—and it eliminates overhead tracks which restrict headroom and interfere with crane handling. Their all-metal construction gives you the permanence of Bonderite-protected galvanized steel . . . maintenance is minimal; and, in steel, you get maximum protection against intrusion and fire.

No other type of door provides all of these important features which are so essential for functional efficiency in busy doorways today. When you are ready to buy a rolling steel door, check specifications carefully . . . you'll find, through comparison, that Mahon Rolling Steel Doors are built better to give you better service over a longer period of time. See Sweet's Files for complete information, including Specifications, or write for Mahon Catalogue G-59.

THE R. C. MAHON COMPANY • Detroit 34, Michigan

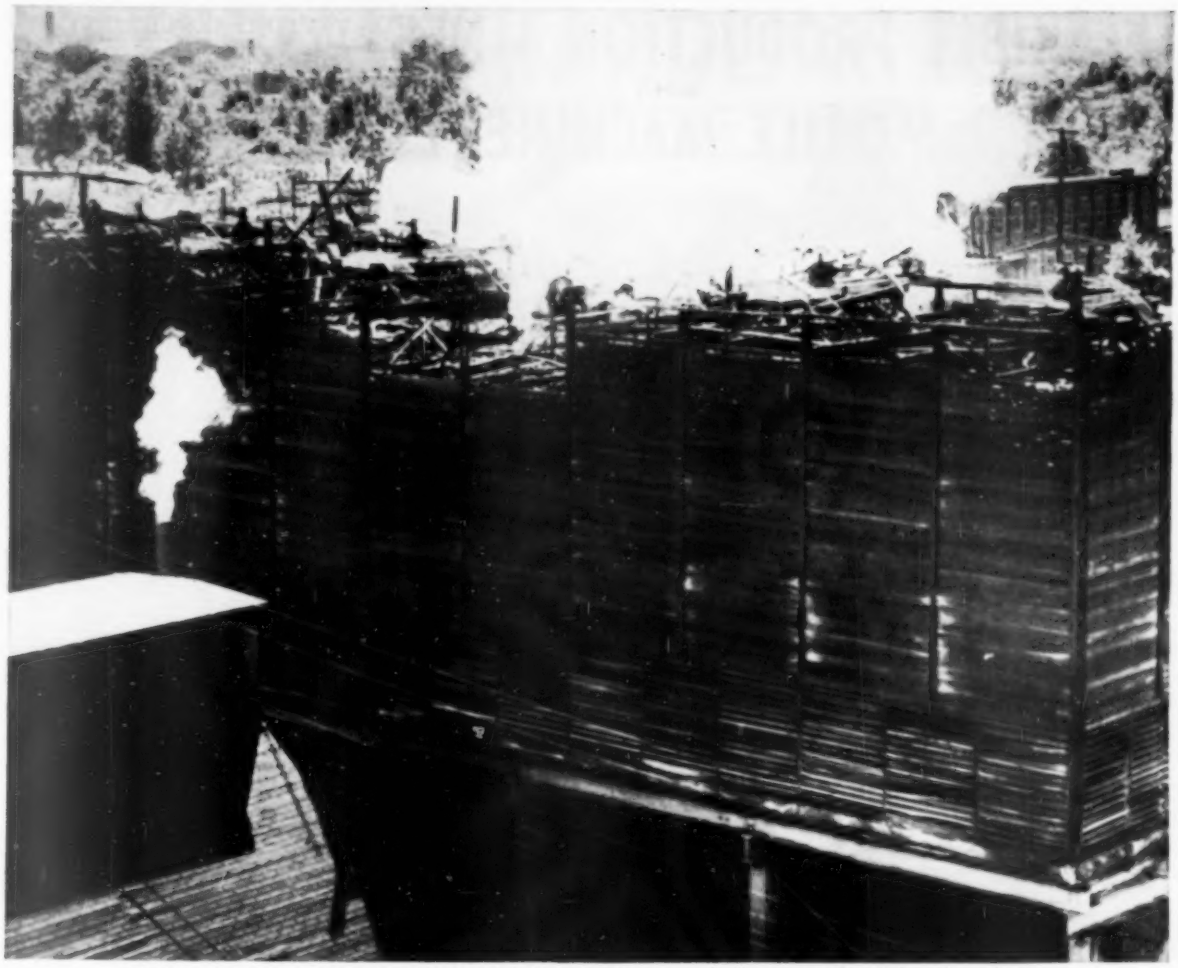
Sales-Engineering Offices in Detroit, New York, Chicago, Los Angeles and San Francisco
Sales Representatives in All Other Principal Cities

Manufacturers of Rolling Steel Doors, Grilles, and Automatic Underwriters' Labeled Rolling Steel Fire Doors and Fire Shutters; Underwriters' Rated Metalclad Fire Walls, Insulated Metal Curtain Walls, Electrified M-Floors, Acoustical and Troffer Forms, Acoustical Metal Ceilings, Steel Roof Decks, and Long Span M-Decks.

ROLLING STEEL DOORS, SHUTTERS AND GRILLES TO MEET EVERY REQUIREMENT

Illustrated above are Ten 12 Ft. x 13 Ft. Mahon Rolling Steel Doors installed in a new, all-metal building constructed at Wayne, Michigan, by the Wayne County Road Commission to house large units of road building and road maintenance equipment.

MAHON



Fire caused by friction spark destroyed top 6 feet of this cooling tower, severely damaging motors, shafts and gear boxes.

Protect your water cooling tower from crippling fire with a Grinnell System!

Water cooling towers are essential in many industries today. But cooling towers can, and do, *burn*! Furthermore, fire may strike when the tower not only is shut down, *but even while it is in use*. One insurance company has stated that nearly half its losses involving towers occurred when the towers were in operation!

Why are cooling towers so vulnerable to fire? Because they are largely made of wood. It is true that when the tower is operating most of the wood is wet. But roof and sides can become excessively dry through exposure to the sun. Also, there is a portion of the tower above the cooling water distribution system that is never wet.

Your best protection against an unexpected blaze is a Grinnell Water Spray or Automatic Sprinkler System. Grinnell will engineer an installation for you that will protect your tower — possibly your entire production program — against fire, no matter how it may start. Common causes of fire include defective wiring, overheated bearings, and lightning. So call in a Grinnell engineer. Let him analyze your needs. Remember, he is well qualified to help you . . . backed by a company with 89 years experience in the fire protection field. Grinnell Company, Providence 1, Rhode Island.

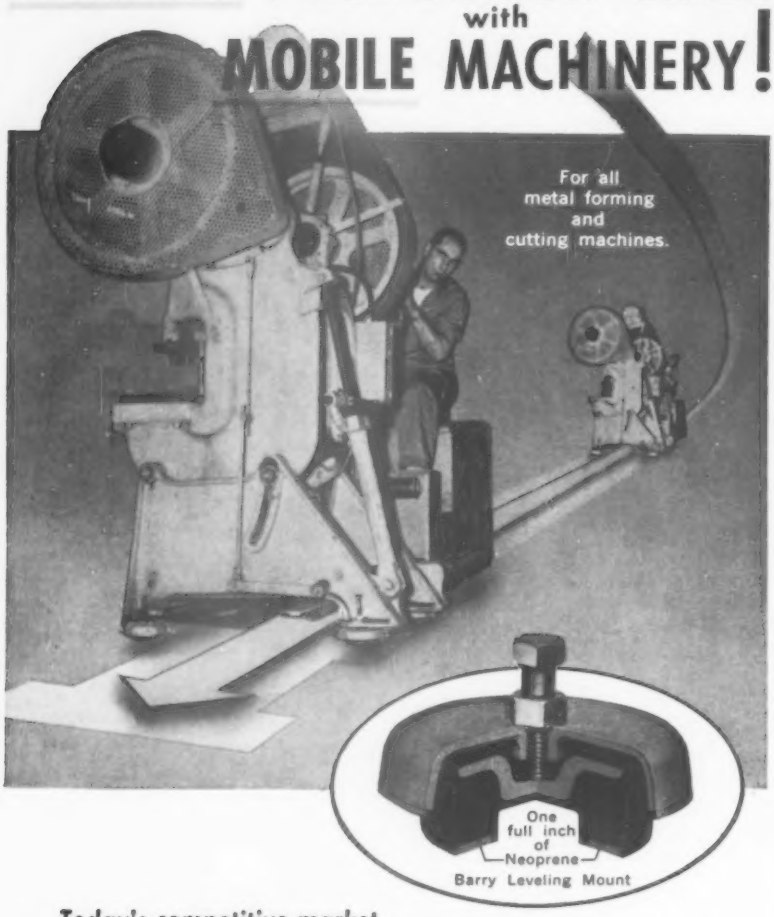
GRINNELL

Fire Protection Systems Since 1870

For more facts Circle 521 on Reader Service Card

For more facts Circle 522 on Reader Service Card

FLEXIBLE PRODUCTION LINES with MOBILE MACHINERY!



Today's competitive market challenges the manufacturer to adapt quickly to new cost-reducing methods and systems — new and improved processing techniques.

Patented Leveling Feature

One important answer to this challenge is plant flexibility through machine mobility.

Modern production facilities no longer bolt their machinery to the floor. Machines on Barry Leveling Mounts are mobile — regardless of size, weight, or type of operation. Easily moved, and installed without drilling, lagging, or shimming, these mobile machines are readily adaptable to changing production requirements.

Proof! One manufacturer moved 86 heavy-duty machine tools in a five-week period without interrupting production. Ask for detailed report on "Resilient Mountings as Applied to Production Machinery".

BARRY CONTROLS INCORPORATED

700 PLEASANT ST., WATERTOWN 72, MASSACHUSETTS

FACTORY / EQUIPMENT NEWS

Begins on page 106

For more about these items, circle item numbers on Reader Service Card next to back cover.

153—Compact Limit Switch is designed with all major friction points of nylon or oil-impregnated bearings. Withstands millions of actuations. Is oil-, water-, and dust-tight, NEMA 12. Trips when actuated by 45-oz./in. force. Rated 600 v. *R. B. Denison Mfg. Co.*

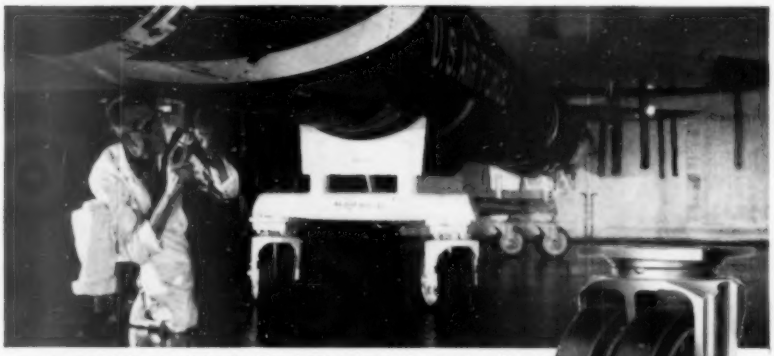
154—Automatic Screwdriver drives ½- to 1¾-in. screws in gages 6-10. One 10-lb. filling of feeder-separator gives hours of continuous duty at speeds to 60 screws per min. Accepts 26 screw sizes without fitting change. Minimizes pre-drilling. *United Shoe Machinery Corp.*

155—Box Shredder, for warehouse and factory, chews up cardboard boxes and containers into condition acceptable by paper mills. Fed by hand or conveyor. Shredded bits can be pneumatically fed to bailer. Saves box storage space, eliminates hand-bailing. *Mitts & Merrill.*

Turn the page

MATERIALS-HANDLING NEWS

NEW AND UNUSUAL APPLICATIONS OF BASSICK CASTERS THAT MIGHT BE ADAPTED TO YOUR HANDLING PROBLEMS



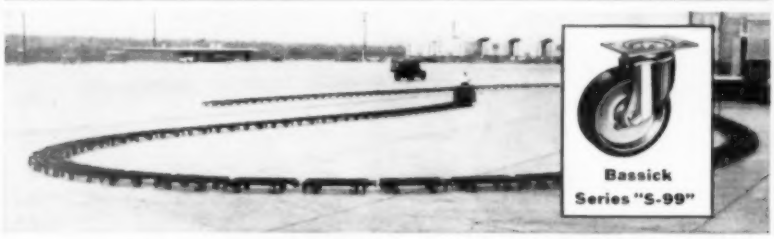
Bassick heavy-duty double-wheel caster with "Floating Hub."

Rolling Ground Support For Air Force BOMARC

The U. S. Air Force "Bomarc" interceptor guided missile made by Boeing Airplane Company, Seattle, Washington, will fly far and fast to guard the U. S. from attack by enemy aircraft.

But in base assembly areas and maintenance shops, as shown here, Bomarc rolls on heavy-duty Bassick double-wheel "Floating Hub" casters. Double wheels give high load capacity and resistance to tipping. The unique Bassick "Floating Hub" absorbs shocks, damps vibration, and eliminates shimmy and bouncing.

Bassick's "Floating Hubs" are the only spring-mounted casters that can effectively absorb horizontal impacts. "Floating Hub" casters are available in a complete line, from light-duty single-wheel types to the heavy-duty type shown here. They're ideal for power-pulled applications, and they keep on rolling under conditions that ruin ordinary casters.



New Rubber-Tired Steel-Side-Plate Wheels

Bassick casters are available with bolted-steel-disc wheels with demountable tires in 3½-, 4-, 5-, 6-, and 8-inch sizes. They're recommended for any institutional or industrial application within the load capacity of the tire.

Look at these big features: • *Floor protection*—highest quality rubber tires • *Replaceable tires* • *Strong, easy rolling*—permanently adjusted bearings • *Neoprene or conductive tires*—available when specified.

Unique "Dolly Train" Rolls On Bassick Casters

At Convair Division, General Dynamics Corporation, Fort Worth, Texas, this power-pulled, 160-dolly train features Bassick casters.

Bassick casters go a long way to insure the dollies' continued efficiency under severe power-pulled service. Ask your Bassick distributor for details on Bassick casters for power pulled dollies and "live skids."

New Automatic Rustproofing for Bassick Casters

Rustproof zinc plating is an added-quality feature of Bassick formed-steel truck casters.

Now, this new $90,000 completely automatic zinc-plating machine at Bassick's Bridgeport plant puts a better, more uniform zinc plate than ever on vital metal caster parts.

Loading and unloading Bassick's new automatic zinc plating machine. Girl on right loads caster parts for trip through machine. Shiny parts on left have already been plated.

Plating tanks of new automatic zinc plating machine. "Standard Salt Spray Test" proves that zinc plate produced by machine is far better than that required by Federal Specifications.

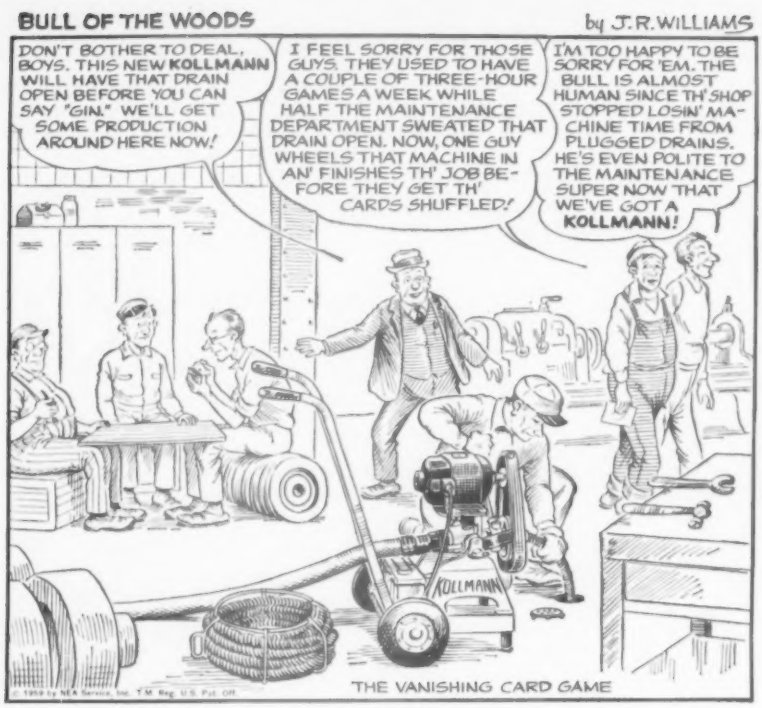
For information on casters... ask your local distributor

There is a Bassick Caster Distributor near you. He's qualified to recommend the right caster for your job. He sees a lot of materials-handling systems and you'll benefit by his knowledge of a wide variety of industrial plants. 9.30

THE BASSICK COMPANY
BRIDGEPORT 5, CONN.
IN CANADA:
BELLEVILLE, ONT.

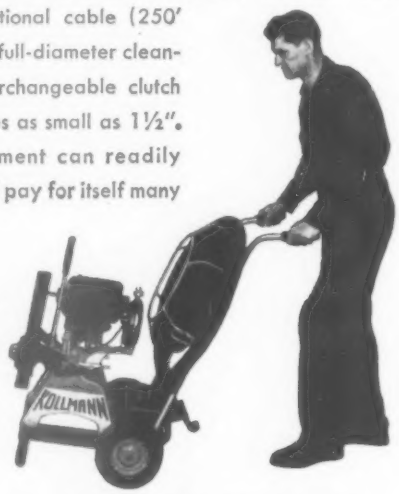
Symbol of SW Excellence
Bassick
A DIVISION OF
STEWART-WARNER CORPORATION

For more facts Circle 524 on Reader Service Card


BULL OF THE WOODS
by J. R. WILLIAMS
DON'T BOTHER TO DEAL, BOYS. THIS NEW KOLLMANN WILL HAVE THAT DRAIN OPEN BEFORE YOU CAN SAY "GIN." WE'LL GET SOME PRODUCTION AROUND HERE NOW!
I FEEL SORRY FOR THOSE GUYS. THEY USED TO HAVE A COUPLE OF THREE-HOUR GAMES A WEEK WHILE HALF THE MAINTENANCE DEPARTMENT SWEATED THAT DRAIN OPEN. NOW, ONE GUY WHEELS THAT MACHINE IN AN' FINISHES TH' JOB BEFORE THEY GET TH' CARDS SHUFFLED!
I'M TOO HAPPY TO BE SORRY FOR 'EM. THE BULL IS ALMOST HUMAN SINCE TH' SHOP STOPPED LOSIN' MACHINE TIME FROM PLUGGED DRAINS. HE'S EVEN POLITE TO THE MAINTENANCE SUPER NOW THAT WE'VE GOT A KOLLMANN!
KOLLMANN
THE VANISHING CARD GAME

YES, THE KOLLMANN "500" CLEARS *Any* STOPPAGE QUICKLY...THOROUGHLY...

● Designed for industrial use, the "500" makes fast work of stubborn flow line stoppages, eliminates trouble and "down time"... and anyone in the maintenance crew can operate it. The dolly-mounted "500" handles up to 150' of sectional cable (250' with larger power units) for full-diameter cleaning of lines 3" to 10". Interchangeable clutch jaws quickly adapt it to lines as small as 1½". *Every* maintenance department can readily justify this machine... it will pay for itself many times over.



See the full Kollmann line at your distributor, or write for literature.

KOLLMANN
MANUFACTURING COMPANY
Erie, Pennsylvania • Phone: Erie 99-1102
Leading Designer and Manufacturer of Drain Cleaning Equipment Since 1936

For more facts Circle 525 on Reader Service Card

FACTORY / EQUIPMENT NEWS

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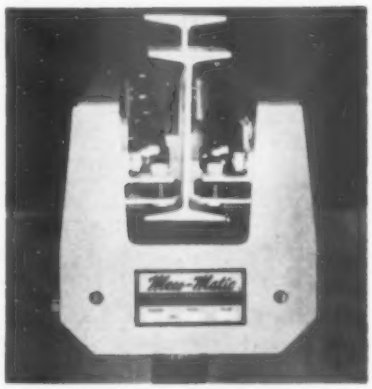
For more about these items, circle item numbers on Reader Service Card next to back cover.



156—Underhung Crane operates on over 40 standard structural I-beam sizes, wide flange beams, or hardened monorail track. Motor-driven, hand-geared, or push-type. Flangeless wheels and side guide rollers bear against the beam's web. *Mechanical Equipment Co.*

157—Silicon Rectifier Line, 250 v. d-c, comes in 400- to 2000-kw. ratings with standard sizes carrying current loads up to 200% for 1 min. Fuse monitor flashes warning when diode fails; locates faulted cell. Diode need not be replaced at once. *Allis-Chalmers Co.*

158—Bin Vibrator moves powder, particles, or grain out of hoppers, down chutes. Handles bins with 4-cu.-ft. capacity. Safe in explosive atmospheres; unharmed by high temperatures. Light 4½-oz. unit uses 3 cu. ft. of air per min. (80 psi.). *Martin Engineering Co.*

Turn the page

Picture of a needless expense— filmed to help management prevent it

The film clip is taken from a Texaco movie about grease, called "Shear Magic." It shows a grease-lubricated ball bearing that has literally been eaten up by rust because improper lubricant was used.

To help you take steps to prevent this same occurrence "Shear Magic" presents the latest advances in greases and grease-testing methods.

You will see how *only* the right greases protect against heat, water, cold, dust, shock, and other conditions. You will find out about new greases, their components and capabilities.

You will learn how the right grease schedule—one planned exactly for your operation—can help you reduce maintenance and replacement costs and substantially improve your company's profit picture.

There is no "hard sell" in "Shear Magic," only informative talk. Texaco will be glad to arrange for a showing of the 25-minute sound film right in your plant. To start the projector rolling, just mail the coupon.

TEXACO

Texaco Inc.
Room 2006, Dept. F-G-20
135 East 42nd Street
New York 17, N.Y.

Please send me information about a free showing of "Shear Magic" to my organization.

Name_____

Company_____

Address_____

City_____ State_____

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

For more facts Circle 526 on Reader Service Card

problem: **Corrosive Acid Fumes**

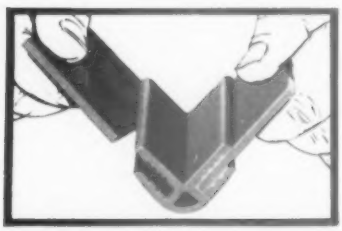
solution: **Van-Cor Exhaust Duct System**

OVER 50,000 SQ. FT. OF VAN-COR SHEET AND JOINING STRIPS remove all acid, plating and cleaning fumes throughout the Allentown (Pa.) Works of Western Electric Co. Corrosion is stopped in its tracks because Van-Cor unplasticized PVC is resistant to scores of acids, alkalies and salts.

Although the contractor was unfamiliar with plastics fabrication, he was able to assemble the components of this system on the job site at a substantial savings over installation of prefabricated components. This savings was made possible through the use of Van-Cor joining strips.

VAN-COR FABRICATIONS, PIPE, FITTINGS, VALVES, CONDUITS offer *you* these advantages:

1. *Resist Corrosion of Industrial Acids & Alkalies*
2. *Light in Weight (⅙ that of Aluminum)*
3. *Easily Installed; High Tensile Strength; Low Flow Resistance*
4. *Readily Formed, Machined, Threaded and Welded*



Van-Cor 90° and H Joining Strips
The fast, low-cost way
to connect PVC sheet stock.

Write for Catalog and Name of Nearest Distributor

INDUSTRIAL DIVISION OF...
COLONIAL PLASTICS MFG. CO.
Subsidiary of THE VAN DORN IRON WORKS CO.
2685 EAST 79TH STREET CLEVELAND 4, OHIO

FACTORY / EQUIPMENT NEWS

Begins on page 106

For more about these items, circle item numbers on Reader Service Card next to back cover.

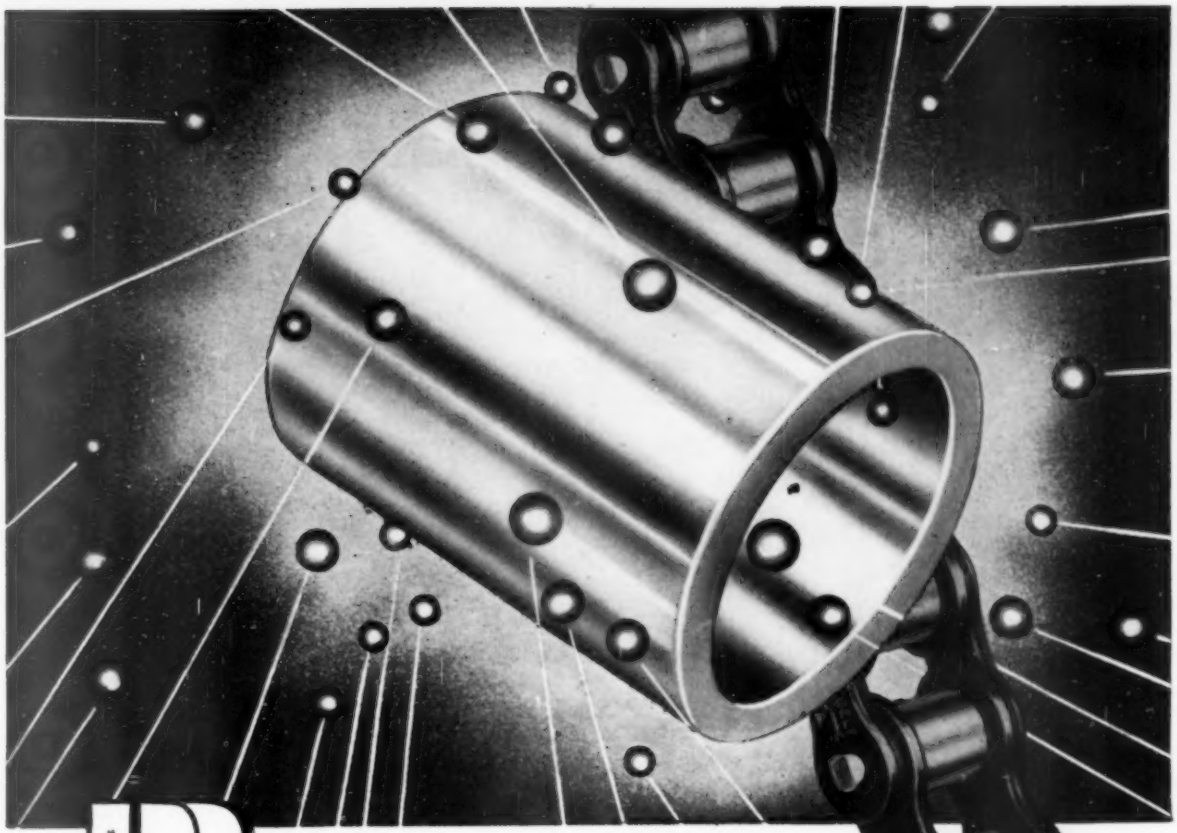
159—Contour-O-Scope quickly and economically measures contour parts to 30 in. dia. and 10 in. wide. Simple to use, operates on same principle as micrometer. Audio and visual signaling gives accuracy of 0.001 in. Checks impellers, inducers, etc. *TurboTronics Corp.*

160—Continuous Solvent Recovery system, for reclaiming chlorinated hydrocarbons from relatively nonvolatile contaminants, is over 99% effective at less than 1¢ per gal. Compact, easy to install and operate. Prevents loss of inhibitors. *Artisan Metal Products, Inc.*

161—Aluminum Fittings, for schedule 10 and 40 pipe, are non-sparking for process industries where explosion is a hazard. Low-friction factor increases flow efficiency and reduces pumping cost. Lightweight. Provide corrosion-resistant lines. *Horace T. Potts Co.*

162—Valve Test Bench has two test plates for testing two different valves at same time. One plate handles ½- to 2-in. screwed valves and 8- to 10-in. flanged valves; another, 2½- to 6-in. flanged valves. Uses gas or liquid for testing at 1000 psi. *Piping Engineering Co.*

Turn the page

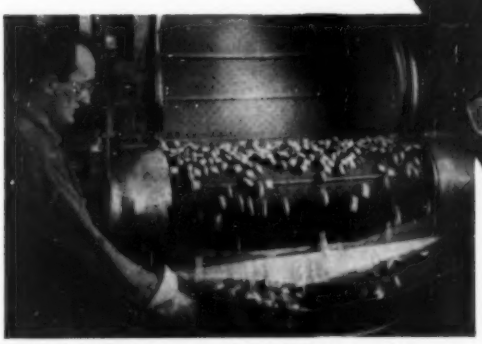


Rollers
fortified against fatigue

Shot-peening "cold-works" extra fatigue life into LINK-BELT roller chain

Shot-peening gives rollers of Link-Belt precision steel roller chain exceptional strength and stamina. And after shot-peening, they are burnished rather than ground or sanded. This achieves a SILVER-BRITE finish—and more important, *retains the fatigue resistant qualities of shot-peening.*

Other long-life "extras" of Link-Belt roller chain include: close heat-treat control, lock-type bushings, pre-stressing, pitch-hole preparation. For details, see Book 2657.



LONG LIFE AHEAD! Rollers for Link-Belt precision steel roller chain tumble out of shot-peening machine after being cold-worked to withstand punishment of today's high-speeds and heavy loads.

LINK-BELT

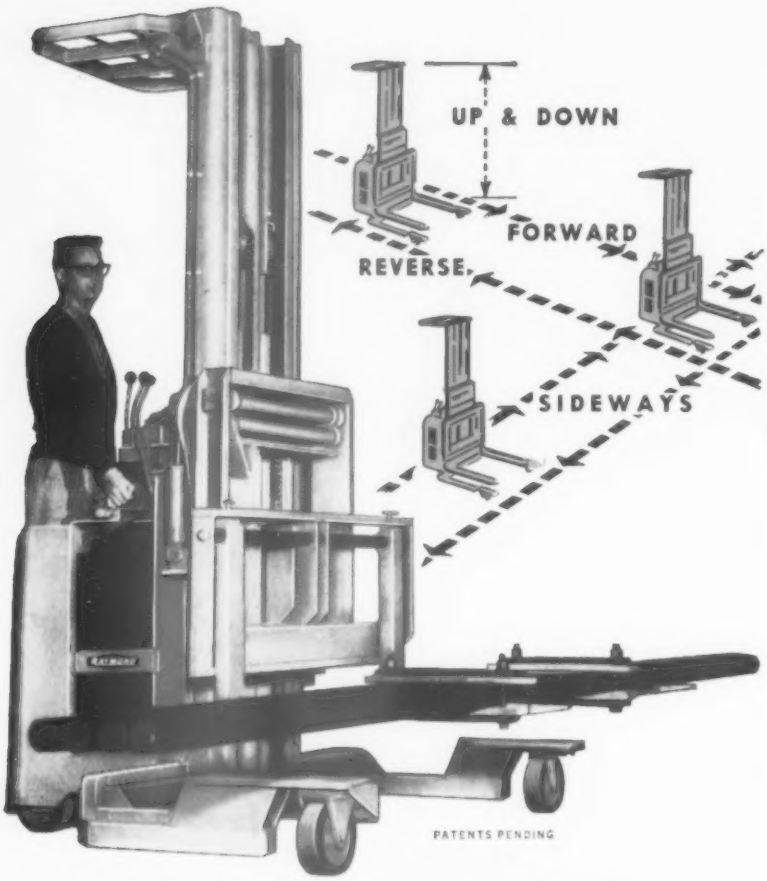
ROLLER CHAINS AND SPROCKETS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices and Stock Carrying Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 35.381

BOOK 2657 has 154 pages of roller chain data. For your copy, contact your nearest Link-Belt office or authorized stock-carrying distributor. (See CHAINS in the yellow pages of your phone book.)

RAYMOND

4-D ELECTRIC TRUCK



move LONG material in NARROW aisles

Bar stock, rods, sheet steel, pipe, tubing, assemblies, carpeting, or any long material is easily handled by the Raymond 4-D Electric Truck . . . up or down . . . forwards . . . backwards . . . or sideways down a narrow aisle. You have to see it to believe it.

MAIL COUPON TODAY

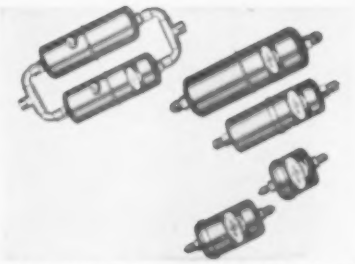
The RAYMOND CORPORATION
3250 Madison St., Greene, N. Y.
Please send Bulletin describing your amazing 4-D Electric Truck

NAME _____ TITLE _____
COMPANY _____
STREET _____
CITY _____ STATE _____

FACTORY / EQUIPMENT NEWS

Begins on page 106

For more about these items, circle item numbers on Reader Service Card next to back cover.



163—Filter-Drier uses blend of silica gel and molecular sieve desiccants to adsorb water and acids from refrigeration systems. Releases no substance into refrigerant circuit. Removes dirt, moisture. No freeze-ups, corrosion or copper plating. *Controls Co. of America.*

164—Key Cabinet Lock opens by combination, not with key. Eliminates weak link in key control—the key that locks cabinet holding other keys. Three types for cabinets with 25- to 1200-key capacity. One is pickproof even with electronic devices. *P. O. Moore, Inc.*

165—A-C/D-C Power Supply combines 3-phase, low-voltage variable transformer with static d-c power supply using highly efficient silicon cells. Control has separate terminals for a-c input, d-c and a-c output. Has 240 v., 50/60 cycle input. *Superior Electric Co.*

Turn the page

For more facts Circle 529 on Reader Service Card

For more facts Circle 530 on Reader Service Card ➤

Black & Decker
No. 16 NIBBLER

Black & Decker
No. 16 SHEAR

Slash metal cutting costs with speedy B&D Tools!

Faster, lighter, easier handling, POWER-BUILT and packed with features

Whether you need the speed of shears or the more precise performance of nibblers—you'll find a lot to like in the easy handling Black & Decker No. 16 Shear and No. 16 Nibbler.

By actual test, they're faster and longer-lived—dramatically cut costs. Their lighter weight means easier handling—centrifugal fans give cooler running. Each has exclusive construction features to stand up under the shock of sheet metal cutting.

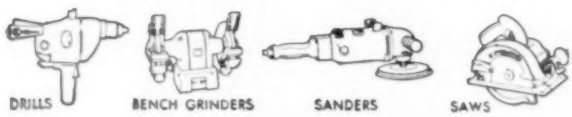
Try these new tools at your nearby Black & Decker distributor. There's a No. 12 Shear, too, for heavier work. For full details on new features, write to: THE BLACK & DECKER MFG. CO., Dept. 0710, Towson 4, Maryland. (In Canada: Brockville, Ontario.)

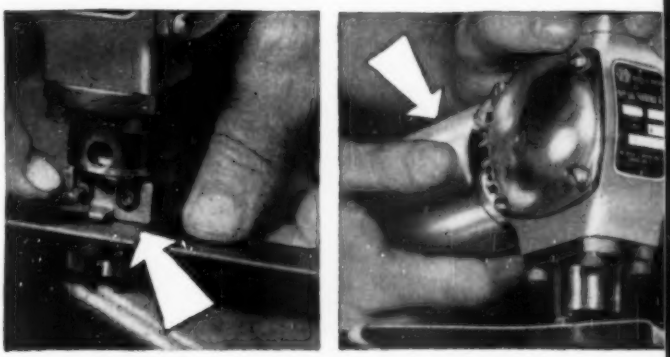
Look Under "TOOLS-ELECTRIC" in Yellow Pages

Leading Distributors Everywhere Sell

Black & Decker®

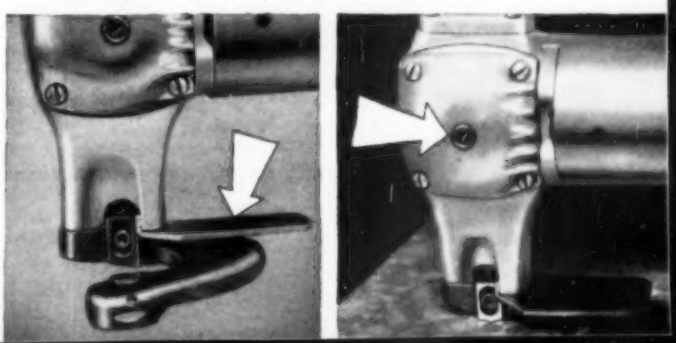
Portable Electric Tools—Power-Built to set the pace





UP TO 3 TIMES FASTER than competition, new B&D Nibbler has twice the life, 20-30% less weight, reversible punch. Adjustable stripper plate (left), smaller diameter (right) are extra features.

50% FASTER than competition, new B&D Shear has one-third less weight than closest competitor, lasts much longer. Deflector plate prevents curling of material. Adjusting screw allows quick positioning of blade.



Hall Industrial Water Report

VOLUME 7 OCTOBER 1959 NUMBER 5

Air Conditioning Means Water Conditioning

To the layman air conditioning means air cooling—nothing else. But the engineers who must operate large air-conditioning systems know the part that water plays in the condensers, air washers, humidity control and chilled water systems. They know too, that they need help to prevent the troubles with scale, corrosion and biological growths that occur wherever water is used.

Hall engineers are ready to give the help needed. They are trained to tackle the specific water problems encountered in air-conditioning systems, just as they are trained to assist you in making water in all industrial operations behave . . . from the source, on through boilers, service systems and process to final disposal.

Big Trouble With A Small Unit

When a Pennsylvania university installed a small air-conditioning system, operation was begun without water treatment. The water used was corrosive. After seven months copper condenser tubes in the refrigerating unit were pitted and perforated. So were steel condenser water boxes and baffle and the steel recirculating water receiving tank. Estimated cost of repairs was more than $10,000.

After this bad start Hall engineers were called. R. A. Danesi recommended replacement of the ruined copper condenser tubes with tubes made from a more corrosion resistant copper alloy. He also recommended conditioning of the cooling water with polyphosphate and set up rigid control of pH and blowdown. Two inspections during the next year revealed negligible loss of metal.

In this case, operating personnel were not aware of the necessity for water conditioning. Future trouble will be avoided by carefully following recommendations.

Dispersive Stops Scale

A Los Angeles building frequently had to clean heat exchangers in the air-conditioning system. The water, high in temporary hardness, attained a pH of 8.2 to 8.5 and produced calcium carbonate deposits when concentrated only one and one-half to two times. Treatment with the slowly soluble polyphosphate Micromet® largely eliminated the calcium carbonate but the system became dirty with calcium phosphate.

Hall engineer L. Arnold first considered reducing the pH of the water with sulfuric acid to stop the calcium phosphate precipitation. Building operators wanted to feed acid but the money needed to purchase feeding equipment was unavailable.

Arnold's next suggestion was to supplement the Micromet with some Hagan dispersive for minimizing accumulation of the calcium phosphate. This was done, and during the next air-conditioning season the heat exchangers were not once taken out of service for cleaning. When opened at the end of the season, they were found to be cleaner than they had been in the spring.

The Missing Bromide

Hall engineer G. E. Starr received a rush call for help from a southern hospital. Boiler water chloride tests gave results as high as 1000 ppm compared to a normal 100 ppm, even though the continuous blowdown valves were wide open.

The unusual condition set off a systematic search for the source of contamination. Plant testing was checked and found to be satisfactory. Conductivity tests on boiler water samples showed that the contaminant made up the major portion of the dissolved solids. This led the search to the zeolite softener used to treat makeup water for the boilers. No salt contamination of treated water was found.

The only place left to check was the condensate, which was found to be badly contaminated. A check of all sources of condensate ended at the absorption refrigeration machine where lithium bromide—not chloride—was leaking into the steam coils in the generator. The bromide was showing up in the chloride test.

Immediate repair of the leak not only stopped the contamination of the boiler water, but also the loss of expensive lithium bromide.

Absorption Refrigeration Machines

Absorption systems are very sensitive to scale. Temperature differentials across the condenser are not very great to begin with, and heat transfer falls off markedly as deposits accumulate in the condenser.

Formation of deposits is encouraged by the fact that the controls respond to light loads by reducing the flow of water through the condenser, rather than by cutting back the supply of steam to the generator. Water temperature rises and the formation of deposits is accelerated.

Serious corrosion of tube sheets in condensers and absorbers can occur because of galvanic action between copper tubes and steel tube sheets. Two methods of tackling this problem are to use corrosion resistant alloys for fabrication of tube sheets or to coat tube sheets with protective coatings. In addition, water conditions must be carefully controlled.

All of this points to the importance of water conditioning for uninterrupted operation. Engineers skilled in this work can be of real help to you.

Industrial Water Problems Require Special Handling

There are no "stock answers" to industrial water problems. For information on how the Hall System can help you solve your particular water problems write, wire or call address below.

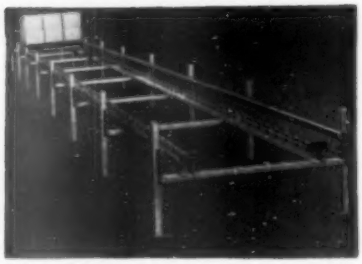
Water is your industry's most important raw material. Use it wisely.

HALL LABORATORIES
DIVISION OF HAGAN CHEMICALS & CONTROLS, INC.
HAGAN BUILDING, PITTSBURGH 30, PA.
In Canada: Hagan Corporation (Canada) Limited, Toronto

Hall Laboratories—Consultants on Procurement, Treatment, Use and Disposal of Industrial Water

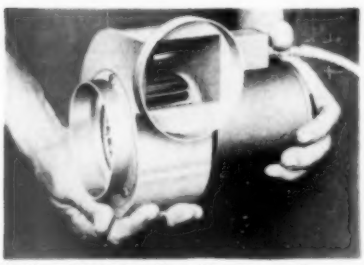
For more facts Circle 531 on Reader Service Card

For more about these items, circle item numbers on Reader Service Card next to back cover.



166—Pallet Conveyor uses gravity principle to handle loads to 3000 lb. at slopes of ⅛ in. per ft. Rails, 10 ft. long, adjust to width and height. Pallets roll on bearing wheels at controlled speed despite split or warped boards, projecting nails. *M-H Standard Corp.*

167—Flexible Pipe Coupling is leakproof, oil-resistant, single-piece tube. Threaded ends come in male-male, male-female, or female-female, sizes from ¾ to 3 in. dia., lengths from 18 to 36 in. Type "S" line rated at 250 psig., 180 deg. temperature. *General Rubber Corp.*



168—Motorized Vent exhausts gases from unit heaters direct to outdoors through side wall of building. Compact unit requires short length of standard, lightweight 4-in. pipe. Motor is thermostat-controlled. For heaters from 25,000 to 300,000 Btu. *Reznor Mfg. Co.*

Turn the page

NOW ... "custom plan" your conveyor system with Standard

HANDIDRIVE

and Standard units for complete belt, "live" roller and gravity roller set-ups

Handidrive conveyors are made up of pre-engineered standardized units, such as drives, take-up units, end roller assemblies, intermediate framework, supports and hangers.

Easy to engineer and install ... at low cost

You can assemble and build a system "custom-planned" to suit your individual needs with Handidrives and other Standard units available out of stock. This service enables you to adapt and change the system from time to time to meet varying requirements as they arise, at exceptionally low cost.

Handidrive conveyors may be individually leveled or inclined. Independent units may be purchased separately to construct power conveyors as desired.

Let Standard show *you* how to build or convert your own conveyor systems with Handidrives. Write: STANDARD CONVEYOR COMPANY. General Offices: North St. Paul 9, Minn.

Handidrive may be mounted at center or end. Standardized units may be purchased individually for extension to present conveyors, or as complete conveyors.

Ask Standard how to cut costs with conveyors

Send for Handidrive Bulletin No. 64. Write Dept. G-10

GRAVITY & POWER CONVEYORS

Sales and Service in Principal Cities

OVER 50 years of conveyor experience

no more knuckle-busting . . .

New RIDGID® No. 450

Portable Tristand Chain Vise

has Large, Easy-to-Operate

Top Screw Handle right up on top

Here's a real time saver. Not only do you get a complete workbench that's truly portable, but now you get a chain vise that's extra easy and fast to operate. Handle is right up on top where it's always handy. Handle and tightening nut are anchored to vise base . . . can't pull out.

Vise base, that overhangs front legs for clear tool swing, has hanger slots for tools, 3-size pipe bender, rear pipe rest and adjustable ceiling brace screw. Folding legs and integral tray set up easily and lock in position for rigid work base. Snap chain holds folded legs closed for easy carrying . . . no loose parts. Rubber grommets in tristand feet prevent creeping. See and try this more-for-your-money RIDGID Top Screw Chain Vise at your Supply House!

New RIDGID Bench Chain Vises
have same Extra-Efficient Top-Screw Adjustment

5 Sizes for ⅛" to 8" Pipe, Conduit or Rod

The Ridge Tool Company, Elyria, Ohio, U.S.A.

FACTORY / EQUIPMENT NEWS

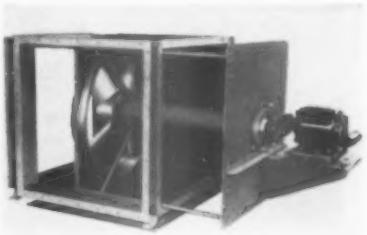
Begins on page 106

For more about these items, circle item numbers on Reader Service Card next to back cover.

169—Tractor Shovel, with over 9-ft. dumping height, reaches to center of high-sided truck or up and over excavation sides. Bucket tips back 40 deg. on ground, with 21,500-lb. pry-out force at cutting edge. Shovel holds 1½ cu. yd. Engine rated 72 hp. *Allis-Chalmers Co.*

170—Mixer-Dispenser, for any flowable, two-part compound, adhesive or potting material, is fully enclosed to minimize toxicity. Uses 80 psi. Manual control for slow intermittent use, automatic synchronization for production line, indexing table. *Pyles Industries, Inc.*

171—Automatic Cutting-to-Length is possible with this controller that connects to all types of shearing mechanism actuated by relay closure. Resets itself after each cut-off. Changes to new length by flipping single lever. Can be punch-tape controlled. *Dynapar Corp.*



172—Elbow Fan handles clean or slightly contaminated air or fumes at normal or up to 750 deg. F. Operates in corrosive or explosive conditions. In five sizes, wide choice of motors. Capacity from 600 to 32,000 cfm., static pressure over 2 in. *L. J. Wing Mfg. Co.*

For more facts Circle 533 on Reader Service Card

For more facts Circle 534 on Reader Service Card ➤

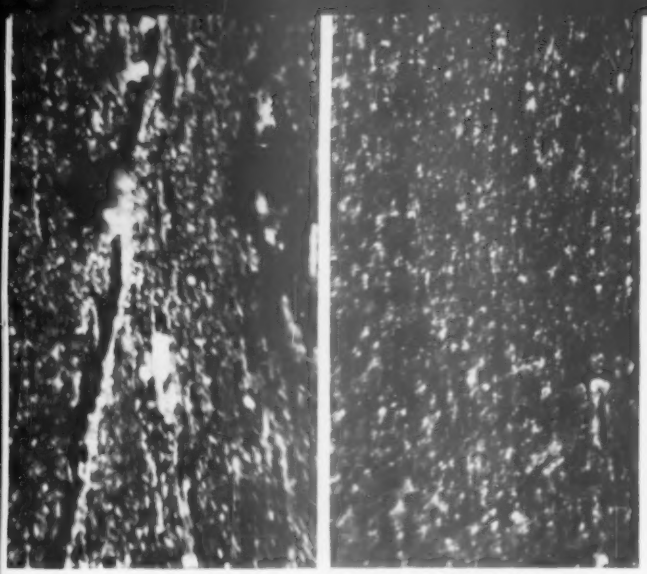
A BRAND-NEW PLANT FOR MAKING HIGH-VOLTAGE RUBBER-INSULATED CABLE... WHY ANACONDA BUILT IT... WHAT IT MEANS TO YOU

Butyl is the most effective rubber insulation yet developed—either natural or synthetic—for high-voltage cable. It has inherent resistance to aging, to moisture, to heat, and most important in high-voltage cable—to ozone.

But—butyl handles differently from other rubbers. And so it demands specialized engineering knowledge, highly specialized equipment, techniques, and precision control at every manufacturing step.

That briefly is why Anaconda built this huge plant at Marion, Indiana—to combine under one big roof the specialists and the specialized equipment needed to make the finest rubber-insulated cable available to you.

Turn the page to see how Anaconda Butyl (AB) Cable was developed and is manufactured. See how each step helps make a better cable for you.



Above you see magnified sections of ordinary cable insulation (left) and Anaconda Butyl (AB) Cable insulation (right).

These screens, used in the extrusion head to entrap possible contaminants, a so fine they actually hold water.

TWO BIG REASONS WHY ANACONDA BUTYL (AB

1. SPECIALIZED DEVELOPMENT

Because Anaconda was the first to develop butyl-insulated cable—and because butyl handles differently from other rubbers—many problems came up during development. Here are some examples—and how Anaconda engineers solved them.

A mixing problem: Like all raw rubbers, butyl in its raw state is a practically useless material. So it's mixed with specially selected additives and ingredients. Because it is very difficult to disperse these ingredients in butyl, Anaconda had to develop an entirely new mixing process and separate facilities to avoid contamination. Look at the comparison photos and see how successful it is.

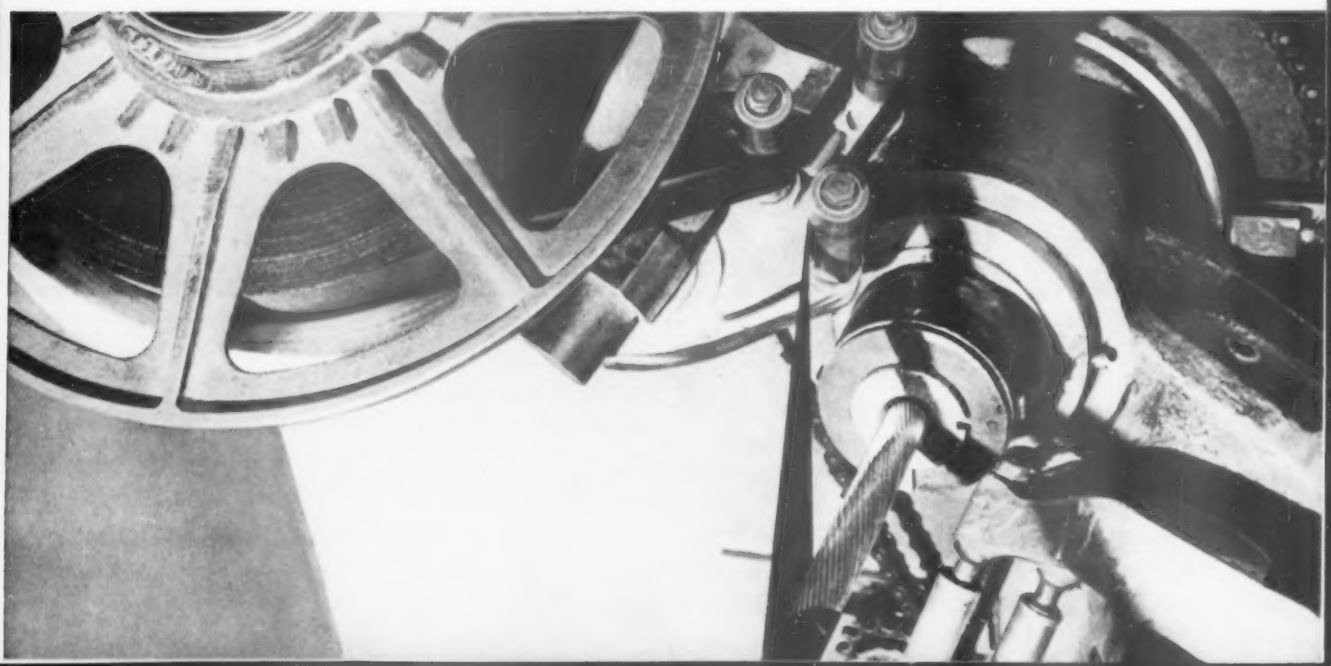
A shielding problem: To eliminate laborious and tim consuming cleaning of insulation surfaces, Anaconda veloped a semiconducting tape* which firmly adheres the insulation—and yet is easy to remove during splic and terminating.

Even a vulcanizing problem: Ordinary vulcanizing equ ment might have a tendency to deform butyl insulation. Anaconda developed huge vulcanizing tanks which ad steam faster, vulcanize quicker and eliminate distortion

These few examples show you the types of proble Anaconda engineers were up against. Their solutions h show you why you can be sure Anaconda Butyl (AB) Ca is the finest cable you can buy.

*Pat. applied

Close-up of semiconducting strand-shielding tape being applied to 500-Mcm tinned copper conductor.



An Anaconda development—semiconducting tape—adheres firmly to insulation, yet removes easily, facilitating splicing and terminating.

MEANS RELIABLE HIGH-VOLTAGE CABLE

2. SPECIALIZED MANUFACTURE

Anaconda's new Marion Mill was designed to handle only one product—Anaconda Butyl (AB) Cable.

The men behind this highly specialized equipment have but one job . . . to study and improve the design and manufacture of rubber-insulated high-voltage cable. Here are a few of the many places where they built precision right into the production line.

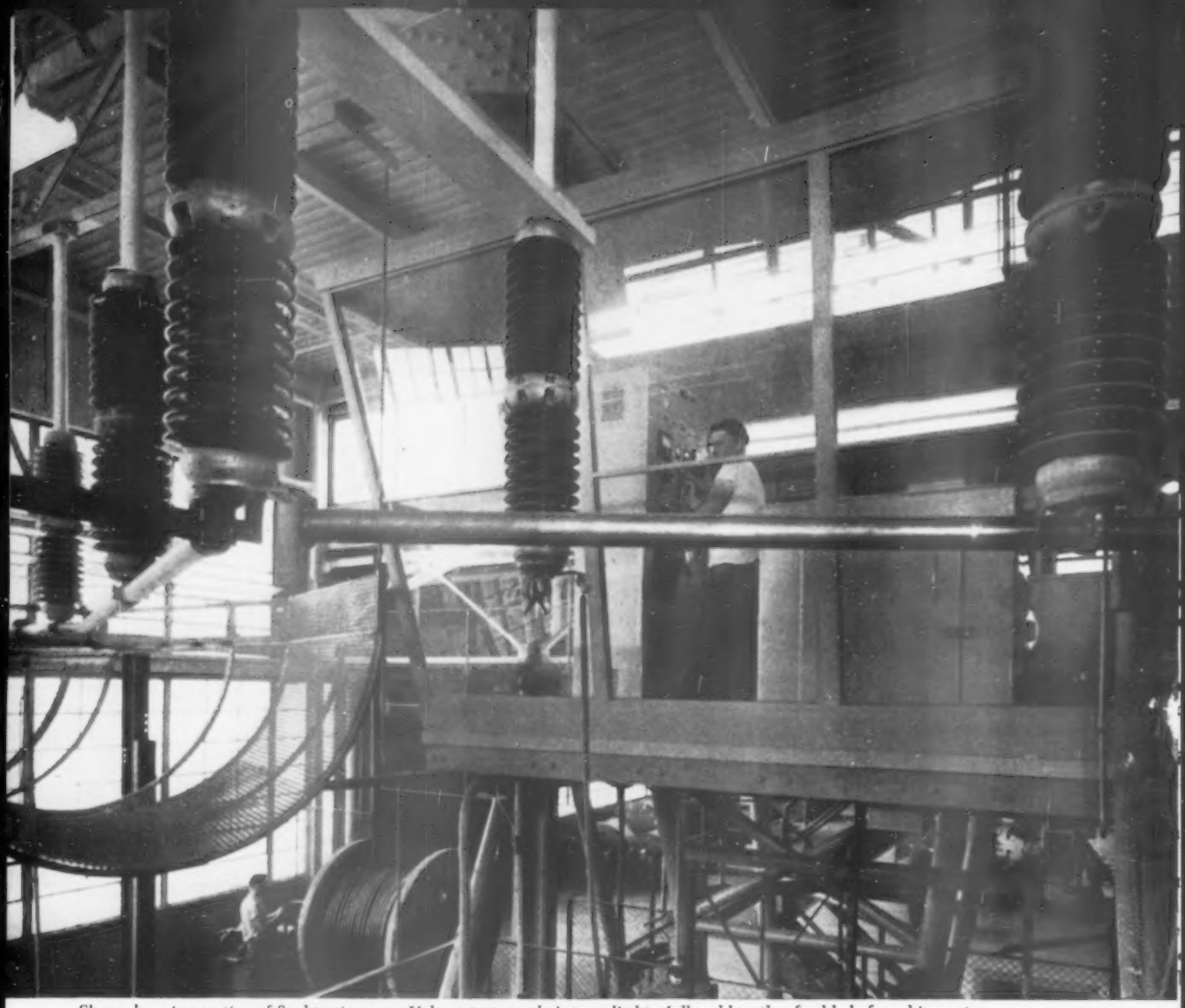
Insulation purity: For extra protection against contamination, the unvulcanized Anaconda Butyl is passed through a series of screens, one of which is so fine it will hold water.

Strand-shield taping: For better equalization of internal electrical stress, Anaconda applies a special fine-mesh semiconducting tape under the insulation of all stranded high-voltage cables.

Vulcanizing in lead: Conventional lead presses must stop periodically for refilling—severely heating up and often damaging the cable section in the die block, so Anaconda extrudes lead continuously. In the next step, exceptionally large drums are used for vulcanizing in lead to eliminate distortion of jackets and insulation.

These few examples help show you that the manufacture of Anaconda Butyl (AB) is highly specialized, highly precise—and why Anaconda offers you the big advantage of consistent high quality.

Huge reel entering large vulcanizing tank which vulcanizes cable quicker than conventional methods, eliminating distortion of insulation.



Shown here is a section of final testing area. Voltage tests are being applied to *full reel lengths* of cable before shipment.

ANOTHER BIG REASON WHY YOU SHOULD CONSIDER ANACONDA BUTYL (AB) CABLE—

SPECIALIZED QUALITY CONTROL AND INSPECTION

From the start: Raw-material suppliers are required to submit certified test reports. Then, tests and sampling at our plant offer extra protection even before production begins. **To finish:** Here's the final inspection line where the finishing touches are applied and where every inch of cable is carefully inspected. Perhaps you already know that Anaconda test procedures are much above industry standards. But do you know that test voltages on Anaconda Butyl (AB) Cable are 125% of industry standards—that minimum corona level is 150% of rated voltage to ground?

Quality control at Anaconda is *more* than mere testing and inspection. It is built into every manufacturing step. That's why you can be sure your Anaconda cable will be of high quality—why you can be sure Anaconda Butyl (AB) Cable is the finest rubber-insulated cable you can buy.

Everything you need to know about Anaconda Butyl (AB) high-voltage cable is neatly summed up in a new booklet, DM-5903, "Anaconda High-Voltage Durasheath* Cable." For your copy, write to: Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y. *Reg. U.S. Pat. Off. 59256 Rev.

ASK THE MAN FROM

ANACONDA®

ABOUT BUTYL (AB) HIGH-VOLTAGE CABLE

FACTORY

PLANT OPERATING MANAGEMENT

CASE BOOK

WARREN J. KING
Manager, Features and Departments

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FACTORY
CASE BOOK

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3-D Models Aid Maintenance

Scale models are an old trick in plant layout. But here's a new use for them: planning and training men for complicated maintenance jobs. The Humble Oil & Refining Company recently used 3-D scale models on two tough refinery modernization projects at Baytown, Tex.

Results were excellent. The models helped supervisors and mechanics visualize situations so they could anticipate problem spots once the job started. They also helped management organize the sequence of work, estimate manpower needs, and figure out the best rigging for moving large vessels in minimum clearances.

Humble's more elaborate model (photo) helped plan a cyclone replacement job in a regenerator 150 feet above the ground. Here 20 cone-shaped cyclone units had to be renewed because of erosion. The model cost $600. But management feels this was negligible compared to manpower and downtime savings.

It wasn't simply a problem of moving the cyclones into position with a crane. They are arranged in a 42-ft. diameter, 56-ft. high shell in two concentric rings. The ten in the inner ring are 5 feet in diameter and 18 feet high; those in the outer ring, 5½ feet in diameter and 21 feet high. The units weigh 13,000 and 19,000 pounds respectively. Naturally the conical shape also contributed to the problem of handling.

The scale model (½ inch = 1 foot) of the regenerator shell and cyclones was built from engineering drawings. Plexiglass formed the outer shell so all interior details were visible. This helped management plan every step of the job. Even showed where to cut a 10-ft. square hole in the shell to get old units out and new ones in. Even temporary hoists and derricks were placed on the model and tried out.

The second model, made of wood and string, solved a difficult moving and rigging problem in the crowded yard area of an alkylation plant. Humble wanted to add four horizontal reactors to this installation. The reactor size (103 feet long, 14 feet in diameter) made them tough to handle in close quarters. To complicate matters, two vessels had to be moved past process equipment and pipelines that could not be disconnected or rerouted.

Humble engineers used a two-dimensional model and scale drawings to check side clearance and a three-dimensional model to solve the

overhead pipe problem. The 3-D model showed the reactors could be moved in only if a 3-ft. deep trench was made under the pipes.

With the help of a special low-design carriage riding on railroad tracks, the reactors moved into position. The model also helped determine placement of the track path to provide adequate maneuvering area for the overhang. Routing each reactor through the congested area was done in 30 minutes without difficulty.

Source: Jodie Isenhower, Head, Maintenance Coordination, Humble Oil & Refining Co., Baytown, Tex.

Quality Control—Fast

(Cover Story)

Engineers have turned over the most time-consuming job in quality control—digesting test data—to a digital computer at Minneapolis-Honeywell's Aeronautical Division in Minneapolis. It digests a two-week long headache into a one-hour task. On one contract alone the new method saved $105,000.

Here's how it works: Complex missile control equipment tests last for hours, take thousands of readings. All these data are recorded on special forms that compare each recorded reading with specified limits. Tests for just one control may require 50 sheets. These data are then put on standard key-punch cards. When enough units have been tested to give a typical quality-analysis profile, cards are fed into the computer at the division's automatic data analysis center.

First the computer scans all cards for obvious errors, warns operator if it finds any. Then it starts to analyze the data. After an hour it has printed a 6- to 12-ft. long sheet digesting all the quality control information needed.

Contributions from readers reporting experiences will be welcomed. No need for fancy writing; just a clear, concise statement of facts. If you have photos or drawings, be sure to include. We'll edit for the Case Book. Contributions accepted will be paid for at time of publication. Address: Case Book Editor, FACTORY, 330 West 42nd St., New York 36.

"Tin" Can Rival?

Conventionally soldered steel cans may meet more vigorous competition from the aluminum industry. The reason is another advance in high-speed, ultrasonic welding of aluminum just announced by the Aluminum Company of America, Pittsburgh. The method holds special promise for container and packaging manufacturers.

Ultrasonics now seam-welds light-gage sheet and foil in thicknesses from 0.006 to 0.010 inch. Speeds are in excess of 30 fpm. Conservative estimates indicate doubling of rate in the near future.

Unlike induction or resistance processes involving melting, ultrasonic seam welds can be stopped and started abruptly. Thus there's no long start up section of inferior quality. Welds are leak-tight, even by helium standards.

World Gets a Wash

Around the world in four hours. That's a record-breaker in any language. It's the time required to brush-clean this 4½ story globe with the help of this hydraulically operated, aerial crane-platform (Pitman Manufacturing Company).

The rubber-impregnated nylon globe was a prizewinner at the Brussels World's Fair last year. Now it stands before Chicago's Wrigley Building to publicize Pan-American games. Operators working on the platform can easily reach the farthest corners of this earth with the crane (owned by Whiteway Sign Company, Chicago). Boom action can be controlled from ground or aloft. Without the "giraffe" cleaning time was 40 hours. Same device could work wonders with those hard-to-reach areas in the plant, too.

Robot Sweeper Aids Maintenance

A "child" of the atomic age will soon help solve Air Force maintenance problems. This riderless monster (photo) can sweep contaminated areas clean of radioactive particles. It starts, stops, turns, reverses, and shifts gears without anyone at the wheel. The G. H. Tennant Company of Minneapolis developed it primarily for emergency use by Air Research and Development Command's Special Weapons Center (Kirkland Field, N.M.) to protect personnel from needless exposure.

An operator remotely controls robot machine from a 12x15-in. panel. In action, the unit sweeps a 7¼-ft. swath "99% clean" at 35 mph. It unloads its hot cargo at the touch of a button.

In dangerous areas sweeper could mount TV cameras for eyes. Then operator would watch machine's progress from a concealed protective shelter. Entire operation would be controlled by radio from a distance. Unit can be operated manually, too. Until an emergency arises, the sweeper will earn its pay keeping hangers and yard areas clean.

SIDES ROLL UP FOR EASY LOADING

Fork trucks can load up to 40-ft. lengths of lumber directly into this new freight car of the Southern Railway System. Car solves the old problem of snaking long pieces in through side doors. Now the whole side is a door. Counterbalanced by springs, it rolls up under the roof like a garage door. Aluminum center post divides the side into two sections, but swings down for unobstructed access to the entire car. Portable aluminum bulkheads move on trolleys anywhere in the car to separate loads. Stakes drop in side pockets for further dunnage. Car can carry 70-ton loads up to 9½ feet high.

Whisks Wires Out

Ever open a vacuum-packed coffee can? Well, the same slotted-key gripping technique is used by Forest City Foundries Company (Cleveland) to remove reinforcing core wires from castings. Only the tools differ. An air-powered Impactool (Ingersoll-Rand Company) with adapter replaces coffee-can key.

Tool's anvil extension has slot in the end. This fits over exposed end of core wire. With power on, wire coils around adapter, is pulled free from casting. Compared with old way of removal with pliers, air tool cuts time in half.

Formerly, castings with burned wires were set aside for salvage because wires could not be removed with pliers, broke under too much tension. Now air tool winds wire tight. Then repeated high-frequency impacts vibrate wire free from casting wall. Process helps salvage potential scrap castings.

Cooks Grease

Cooked grease is dished up in this "kitchen." It's all part of a new piping system that handles packaging of grease at Esso Standard Oil Company (Pittsburgh). "Jump-over board" (photo) routes grease through its entire cooking cycle.

Through lengths of transfer hose that are connected to different valves on the "jump-over board," grease is directed from the cooking kettles through various units of process machinery. Then finally it goes to storage tanks or a central container filling area.

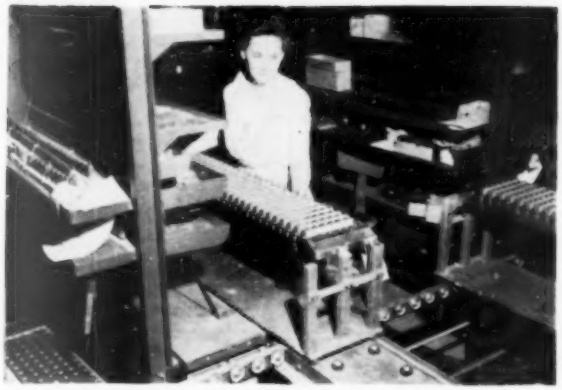
To clean pipes after various product runs, a "pig" is pushed through lines by air pressure. "Pig" is a neoprene ball. As it travels through lines, it pushes out collected grease. System (designed by Blaw-Knox Company) has over 3000 feet of 3-in. diameter pipe.

No Scrap Here

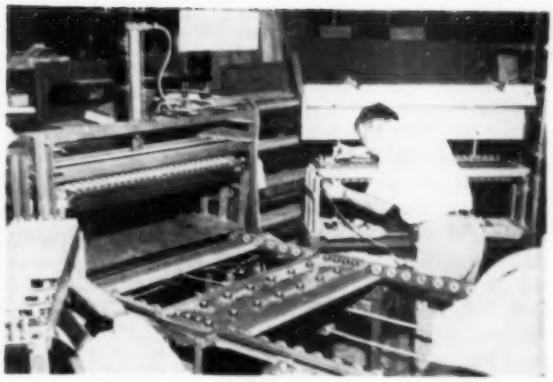
Here's how to get extra mileage out of raw materials at the Reznor Manufacturing Company, Mercer, Pa. Fan blades are now made from pieces of cold rolled sheet steel. The leftovers come from holes punched in space heater casings that were formerly discarded.

Reznor fabricates these 12- to 18-in. round blanks into one-piece, four-blade propeller fans. Before making its own fan blades from scrap, the company purchased aluminum blades from outside suppliers. New blades work every bit as well—and cost less.

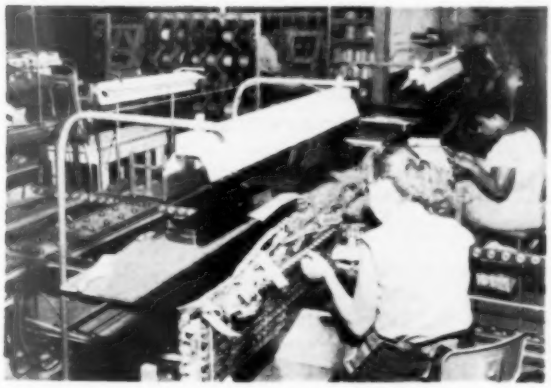
Fabrication of steel blades from circular pieces of metal is simple. The fan blade is blanked in one operation, then the hub (a screw-machine product) is riveted to the blade. After each blade is pitched properly (photo), electronic balancing shows exactly where weights are needed. Fringe benefits include savings on scrap disposal, housekeeping, and material-handling chores.



1. CARRIERS MOVE OFF AND ON CONVEYOR EASILY.



2. TRANSFER RAISES UNITS TO RIGHT LEVEL.



3. CARRIER TILTS, MAKES WORK REACHABLE.

4. CHECKER TESTS 1100 CIRCUITS.

Conveyor Ups Production Capacity 50%

"Installed a new 152-ft. gravity conveyor. Increased production potential 50%." That's what they say today about the new crossbar switch assembly-line conveyor at the Chicago plant at Kellogg Switchboard and Supply Company, a division of International Telephone & Telegraph Corporation.

The 12-ft. wide conveyor operates at two levels while servicing 56 production stations. Together with the work stations, it occupies about 2300 square feet of floor space. Here all assembly operations are performed on the crossbar switch mechanisms used in Kellogg's telephone switching equipment. At individual work stations, operators transfer assemblies (mounted on specially designed aluminum carriers) onto spur conveyors, where assembly operations are performed. Line output is estimated at 40 units per day.

The main line is a skate-wheel, push-along conveyor with a powered chain-wheel carrier return. The equipment, costing $14,000, was custom built to Kellogg specification by the Samuel Olsen Manfacturing Company of Chicago. Kellogg's industrial engineering department detailed the plant layout work and supervised the installation of all the equipment.

Kellogg uses 100 semi-rigid carriers to facilitate the movement and assembly of crossbar switches. Each switch rests on four of six locating legs and is secured by pivot pins. With this arrangement the operator can tilt the switch at any angle up to 180 degrees. Rollers on the bottom of carriers maintain alignment as carriers ride conveyor tracks.

To get a better idea of how the line operates and a closer look at some of the time- and work-saving features, follow an assembly as it moves down the 152-ft. conveyor:

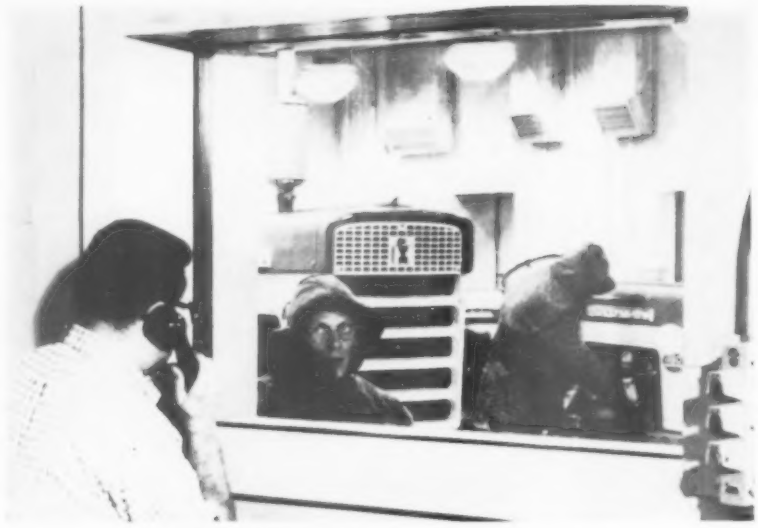
• At the initial assembly stations basic components are attached to the crossbar frame mounted on the aluminum carrier. With ball-conveyor transfer tables operators move assemblies easily from the main conveyor line to spur assembly stations (photo 1). While at the individual assembly stations, carriers are locked in place so they will not inch back onto the main conveyor and collide with other units. Assembly stations are located on both sides of the conveyor. Assembly is progressive as units move along the main conveyor line.

• At the second group of work stations, select-rod mechanisms, actuators, and springs are properly adjusted. These units are located on top of and beneath the switch assemblies. To help operators perform these operations more comfortably and efficiently, assemblies and carriers riding on the conveyor are raised 15 inches by an air-operated elevator just before they reach these stations (photo 2). To increase ac-

cessibility further, each station in this group is equipped with a lazy susan work platform, so the operator can rotate the carrier 360 degrees in 90-deg. increments.

• Just prior to the next assembly operations—cable assembly—a second air-operated elevator lowers the crossbar assembly and carrier 15 inches. The cable assembly operators can rotate the carrier as was done at the previous stations. Or they can rotate the work in the carrier to make hard-to-reach points underneath the assembly sections more accessible (photo 3).

• At the final stations on the line, crossbar assemblies are tested for routing accuracy (photo 4). Here an automatic tester indicates a failure in any of 1100 circuits. Following this operation, the switches are packaged and stacked for shipping while the carriers are placed on the return track by air-operated lift.



TEST ROOMS RUN HOT AND COLD

Trucks and tractors get a good stiff dose of winter weather in this "cold room" at International Harvester's Farm Equipment Research & Engineering Center, Hinsdale, Ill. Controlled temperatures down to 50 F. below zero are maintained here to check engine warm-up time, cold-starting efficiency, carburetor development, and hydraulic systems. A few feet away, a "hot room" tests cooling systems under load. Here temperatures exceed 130 F. Facilities are all part of the recently opened test center that brings nearly all International Harvester's scientific and technical staffs under one roof.

Cuts Changeovers

Here's one way of avoiding time-consuming wiring hookups when different types of electronic equipment come to the test floor. It's especially useful where types of equipment change often and runs are too small to warrant a special test bench. The trick? Put all auxiliary components and necessary wiring in a separate test chassis. Then make it fast and easy to connect the component under test, the test meters, and the power supply.

For each type of amplifier and major components, Magnetic Amplifiers, Inc. (New York), builds a standard test chassis. A typical chassis has jacks and polarity pilot lights along the top for connection to instruments. With a multiconductor female connector on one side, a variety of auxiliary and test fixtures can be hooked into the basic chassis. Meanwhile connectors for power supplies and on-off or stepping switches are on another side. With switches, the chassis can be used for a variety of tests.

Fastened to the center of each chassis is a procedure sheet. Where the chassis is used to test a family of components, the sheets are bound in a looseleaf book. The sheets specify instruments needed, their location, connections, and switch positions for each test.

To test a component having a dozen or more connections, the chassis top serves as a test table mounting while a ring of color-coded speed clips holds component lead wires. For a completely assembled circuit or production chassis, the unit may be connected to an auxiliary fixture by gang plugs and attached in turn to the female connector of a chassis. Lever arrangements for quick connect and disconnect of the unit are used on auxiliary fixtures.

Maintenance Men Qualify on Tests

"Our selection procedure is designed to keep misfits out of maintenance jobs," says Glenn R. Harmon, training manager at General Foods, Inc. (Minneapolis). The procedure was negotiated with plant unions in 17 separate locations. It calls for awarding maintenance jobs to the senior applicant if his work history is satisfactory and if he can pass three mental fitness tests. One test is for basic ability to learn, reason, and solve problems. Another tests his mechanical comprehension. A third tests his ability to add, subtract, multiply, and divide.

After a man is accepted for maintenance work, he has still further testing hurdles to leap. He moves from the helper classification to third class only after he has satisfactorily served his time as a helper and passed another test. And a test figures in his promotion from second to first-class maintenance man.

One thing the testing uncovers is the area where a man may be weak. Suppose, for example, the man

DREAM LIGHTING WELCOMES NIGHT SHIFT

Night-shift workers never get the feel of working in darkness once they get near the new $2-million plant of P. H. Hanes Knitting Company, Winston-Salem, N. C. Thirty-two 2-lamp, 6-ft. luminaires on davit-type aluminum poles bathe the parking and truck dock area as well as the streets in front of the plant with an average of 1.2 foot-candles of illumination. Hanes figures three factors will make this outstanding exterior lighting job pay off. First, night truck loading and unloading will be easier and faster. Second, better lighting will discourage vandals. And third, employee safety, convenience and morale will be improved.

scores well as a millwright and carpenter but shows up poorly on the electrical questions. Ninety days later he can repeat the test. In the meantime, he is expected to become skilled in his weakest area. If he flunks the third-class exam twice, he's out. But almost no one flunks.

Keeps Data Current

Here's a scheduling system that works without a single sheet of paper. What's more, it shows supervisors at the Ray Burner Company (San Francisco) at a glance how orders are moving through the plant and when delivery dates are near.

This new planning aid is called Rol-a-Chart (Conley, Baltzer, & Steward Company). With it Ray Burner keeps visual tabs on the production of over 50 types of oil burners with an infinite number of design variations. The chart features completely flexible scheduling, shows exact status of orders and promised delivery dates. Ray Burner lists order data at the left side of the chart on a stationary plastic panel. On a wide, endless transparent belt at the right expeditors note deadlines, progress, delays, and the foreman's order-completion commitments. All notations are made on the Mylar face of the chart can be easily erased.

Flexibility comes from the roller-mounted, wide belt (to right of order listing). With this, expeditors can move notations on operations and delivery dates forward or to the left so the chart is always up to date. A stationary grid behind the belt keeps entries in the correct relative position. Each square on the grid represents a day. Each day the belt is advanced one square by turning the rollers. Thus the visual indication of how each order is moving toward completion is kept current.

As soon as an order is received, it's posted on the left-hand panel of the chart. The assembly foreman assigns a delivery date the moment the order goes into the plant. He uses a red pencil to identify his promises from other entries. Ray Burner usually keeps a 90-day supply of parts on hand, and builds units from stock parts. But if there's a delay due to part shortage or some other reason, it's noted on the board, too. A Ray Burner spokesman reports the firm is well pleased with the new system.

See-Through Dress

Dressed in its transparent best, this control panel is on its way to a customer from General Electric Company's San Leandro (Calif.) plant. With see-through polyethylene film (Visking Company), freight handlers can see delicate instruments inside. This encourages them to take more care to avoid damage.

This low-cost plastic protection also is moisture-proof. It won't crack or break regardless of temperature. In addition, last-minute inspections can be made without disturbing the package. Before G-E adopted the new method, units were housed in paper, then crated.

Idea Market Zooms

The idea market is still bullish. Companies continue buying employee suggestions in record volume, says the National Association of Suggestion Systems, Chicago. Sylvania Electric Products, for example, has increased payoffs by boosting the

amount an employee may earn with an idea. New top is $25,000.

Other blue chips in the suggestion market also find employee suggestions good business. General Motors Corporation has used 25% of the 2-million ideas received over the past 17 years. Awards total over $28-million. And Standard Oil (New Jersey) has divided $3-million for the 104,000 ideas it has adopted in the past 40 years.

It's All on Cards

Another company has found pint-sized blueprints pay big dividends. Field representatives of Rocketdyne Division of North American Aviation Corporation (Los Angeles) aren't carrying "field packs" now that blueprints are microfilmed, then sandwiched into standard-size IBM cards. Packaging and shipping costs are down by as much as 5000%.

The cards, edge-punched and face-printed, carry all necessary information for sorting and classification. A 1⅜x1⅞-in. aperture in the card accommodates the microfilm. Rocketdyne groups cards into sets of 3000 to 4000 according to the complexity of the propulsion system under study. Several field men usually use one stack of cards. But a man carries a complete set if he is working alone.

With some extra care in handling, cards can be run through automatic sorting equipment. But carelessness can result in scratches.

In the field, a microfilm viewer permits easy inspection and allows reproduction by tracing on transparent paper placed over the viewing screen. Also, films can be enlarged to half the original blueprint size in the field. Special duplicating equipment at the main plant enlarges prints to full size.

County Helps in Training

For only $3 (registration fee) per man, employees of Lockheed Aircraft Corporation's Georgia Division (Marietta) can learn such subjects as electronics, or mathematics for radiomen and electricians.

The company keeps track of the number of employees who show an interest in any subject. When enough interested employees (usually about 20) are informally signed up for a subject, the company's training department passes the information on to the Cobb County (that's Marietta's county) Board of Education. The county goes to work, plans a course, and provides the vocational training under the provisions of the Smith-Hughes Act. The entire operation is done on the employee's time and expense.

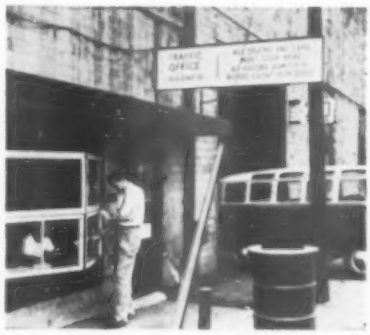
Course hours are arranged for either day shift or swing shift personnel. Most courses run 2½ hours, two days per week. Usual length of courses is 12 weeks.

This arrangement with the county supplements the company's own training efforts. Months ago, when the company received delivery of a mailing machine controlled by a digital computer, there was a trained maintenance force ready to keep it running. Men had been trained for the work in a special course. The instructor for the course had previously been sent to M.I.T. to learn programing and to the manufacturer's plant to learn about the machine.

Plastic Spots Stress

Something new is pinpointing stress areas on metal parts at Convair Division of General Dynamics Corporation (San Diego). Method, called "PhotoStress," involves covering part with plastic. This material then shows up strain pattern in color as the part undergoes stress analysis tests. Here's what happens:

The birefringent properties of the plastic convert strain into color under polarized light. The deformed area of part being stress-analyzed shows up on plastic material as two sets of fringe lines. Black fringes give direction of principal strains, while color fringes indicate the magnitude of principal strains. Material comes in flat sheets, contoured sheets, or liquid form. It's bonded to the part. This method of indicating stress is said to eliminate uncertain results heretofore obtained by stress-analyzing plastic models of parts.



Drive-Up Window Speeds Traffic

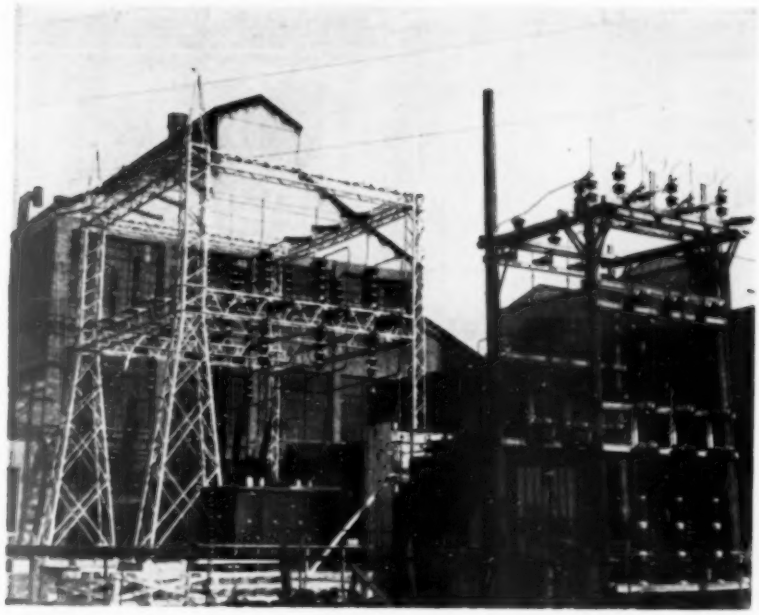
The drive-up feature of this plant traffic office gets trucks in and out of plant areas fast. The Barnebey-Cheney Company (Columbus, Ohio) chose a central location near shipping, production, and the warehouse so truck drivers could receive directions to exact pick-up destinations.

The old office was closer to the street. Thus trucks waiting instructions blocked parking-lot traffic. Besides, drivers often forgot or misinterpreted directions by the time they got into the plant area. Now traffic clerks can point out the way to all buildings.

More advantages: The drive-up office location cuts waiting time before trucks enter the plant. Now a driver just asks his questions at the window and doesn't enter the office. The window provides an extra security checkpoint.

The new office has 142 square feet of floor space. It's built of concrete block, has steel doors. An overhang roof protects inquiring drivers from the weather. Though it's smaller than the old office, efficient use of floor space makes it more than adequate. The old quarters are now used for storage.

An unexpected benefit: The new arrangement works so well that traffic personnel now use the time saved to do additional jobs.



Change Planned, Trouble Avoided

Modernizing your plant's master substation to meet increasing power demands isn't an easy job under the best conditions. And you can't do it overnight, either. But with careful planning, you can do it with minimum complications.

Westinghouse Electric Corporation's Sharon (Pa.) plant did this trick—and had to cut power only during three 48-hr. periods on weekends. This averted any loss in production. And the problems faced by Westinghouse engineers were about as complicated as you could encounter anywhere.

The entire project took 16 months from start to finish. This time cycle included planning, designing, purchasing, and installing a complete new main substation (photo). The new equipment is located exactly where the old 12,000-kva. unit was. In addition, the new set-up can operate either from the power company's 69-kv. feeder or from its 138-kv. line.

This modernization resulted from some just-in-time planning by Westinghouse and the local power company. In the summer of 1956 Westinghouse discovered its present primary unit-substation facilities might not be able to handle the anticipated load during the 1957 summer peak period if temperatures rose well above normal. The existing substation had three single-phase transformers plus one spare, with rated capacities of 4000 kva. each. These were fed by two 69-kv. utility lines, supplied secondary voltages of 6.9 and 2.3 kv.

About the same time the local utility took inventory of present and projected customer demands. The utility asked Westinghouse and other local industrial plants to provide figures on anticipated load requirements for the next 10 years. Soon after receiving these data the utility told both Westinghouse and a large steel plant to prepare to receive service at 138 kv. (instead of 69 kv.) sometime in 1958. Only by dumping the loads of these two plants from the existing 69-kv. lines could the utility continue to supply other area customers.

With time short, Westinghouse assessed the over-all situation, made the following decision as guideposts for the project:

- Power interruption had to be minimized. With production requirements at near capacity, Westinghouse couldn't afford shutdowns.
- The new substations had to be installed in the same location as the old. No other space was available, even though the only passage to the site was through a 10-ft.-wide, 105-ft.-long unpaved corridor between buildings.
- The existing 69-kv. tower and overhead structure had to be replaced. It just didn't allow enough clearance for the 138-kv. equipment. And there wasn't enough room for both towers.
- The new facility had to handle 69-kv. power as well as 138-kv. This was necessary because the exact changeover date to the higher-voltage service was not known.

How did Westinghouse solve all the problems involved? Well, here's a step-by-step description of the procedure followed:

1. Cooling fans were installed on the existing 12,000-kva. transformer bank to provide an immediate cushion of reserve capacity.

2. Two new three-phase transformers were designed to receive either 138 or 69 kv. on the primary, with secondary voltages of 6.9 and 2.3 kv. With special design, units could pass through the narrow entry space to the site.

3. The first new transformer (along with secondary circuit breakers) was installed temporarily under a 69-kv. wooden overhead structure. This was erected in one corner of the existing substation (at right in the photo) and was fed by one of the two 69-kv. utility lines. As soon as this temporary set-up was completed, it was put into service during a carefully planned 48-hr. weekend shutdown.

4. The old 69-kv. equipment was now disconnected but was left in place in case of emergency. Meanwhile work went ahead on the 138-kv. tower foundations, new grounding system, substation pad, and two new cable pits. These 5-ft.-wide by 8-ft.-deep pits run from directly under switchgear cubicles at the sub to the powerhouse basement. Wall-mounted trays carrying low-voltage cables offer flexibility and convenience. Pit tops are open, but a 2-in. curb keeps surface water out.

5. Because of space restrictions, primary disconnect switches, metering equipment, 138-kv. oil circuit breakers, and a control house had to be remotely located.

6. During construction of the utility's substation Westinghouse removed the old transformers and oil breakers, then moved the second new transformer into the area for use in case of emergency.

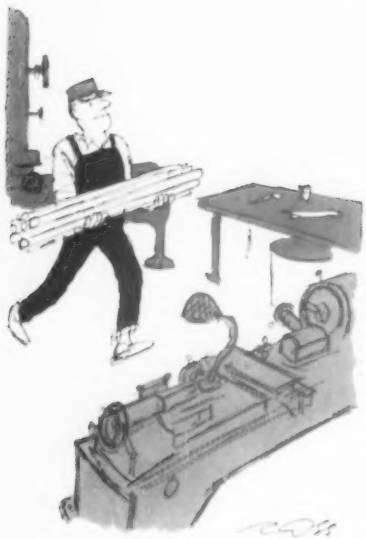
7. The most critical period came with the cutting of the second origi-

YOU BE THE ARBITRATOR

THE CASE OF

The Added Workload

Out of the experience of the American Arbitration Association



When a job-evaluation plan was set up in a plant manufacturing oil heaters, it was decided that a hand trucker would move material between departments and assist machinists by delivering stock as needed. But things didn't work this way in practice. Since the stockroom was close to the lathes and the trucker was often not around, machinists found it more convenient to pick up the stock themselves. It amounted to only a few minutes a day and nobody objected.

But after several years management decided to rearrange the flow of work. They transferred the trucker to another job, announced that getting stock would officially be part of the machinists' jobs. The trucker was satisfied and didn't grieve. But the union filed a grievance—claimed management couldn't make this change without first discussing it with the union, and cited this clause: "The company will bargain collectively with the union with respect to rates of pay, wages, hours, other conditions of employment."

The company said this clause had nothing to do with the situation. It cited, instead, the management prerogative clause that "except as otherwise provided herein, nothing in this agreement shall be construed as limiting the company in its exercise of regular and normal functions."

Eventually the case went to arbitration. Suppose you were the arbitrator. How would you rule?

For the actual decision turn to page 156

nal 69-kv. line. This put the entire plant load on the temporary structure and one feeder. To rush the project, work was put on an around-the-clock schedule. As soon as workers dismantled the old tower, the new 138-kv. one was erected. Then the second transformer and associated switchgear were put into final position on the new base. Finally the new 138-kv. lines (operating initially at 69 kv.) were strung between the new tower and the utility substation.

8. The plant was now ready to operate from one transformer in the new substation. Again the switchover was scheduled for a weekend. This time the changeover took less than 24 hours. This allowed ample time for checking control and relay operation under load without hindering production.

9. After a one-week test run of the first permanent transformer under full load, the other transformer was disconnected and moved from the temporary structure to its permanent location, together with its metering equipment. A third weekend shutdown gave plenty of time to run overhead cables from the temporary structure to the second newly placed transformer. This was done to assure Westinghouse two separate feeders while awaiting completion of the 138-kv. line.

Source: R. V. Bruce, Works Engineering Department, Westinghouse Electric Corp., Sharon, Pa.

Melts Curing Costs

Cost of producing V-belts is down 33% at the Thermoid Division of H. K. Porter Company, Trenton, N. J. The reason? A new vertical vulcanizer equipped with quick-change molds. Intricate apparatus and manual handling have been eliminated. The cylindrical steel mold carrying the belts to be cured is simply hooked to a chain hoist, maneuvered into position, and lowered into the tank. During curing in the closed tank, the mold and belts are placed in a bag or sleeve.

Mold changing is so fast that the mold is always hot. Thus warm-up time is unnecessary. Furthermore, changeover from one size mold to another is so quick that warm-up time is insignificant. Steam pressure on the outside of the belt and temperature on the inside are recorded on panel gages.

Molds—with twice the former capacity—mean faster curing, more uniform size and finish. Because of results with the initial unit, Thermoid plans to install 11 more.

Explains Why It Costs More

Having trouble explaining the price squeeze and high cost of living management faces? This example from Worthington Company (Harrison, N. J.) may help you.

In 1936 the Harrison Division bought a turret lathe for $7400. Tax laws permitted the company to lay aside the original cost as depreciation, at the rate of so much a year for the life of the machine.

In 1959 the lathe was obsolete. The company had $7400 in depre-

ciation reserves to buy a replacement. In addition, the machine had a resale value of $1000.

But replacement cost was $32,000—for a simple lathe that merely performed the same functions as the old model. But a better lathe, with attachments to keep pace with technological advancements, cost $52,000. As has been shown, the company had only $8400 toward a $52,000 purchase. The $43,600 difference came out of profits.

To get $43,600 profit Worthington had to earn about $90,000 before federal corporate taxes of 52%. And to earn the new machine's cost, the company had to sell about $900,000 worth of products at its net-profit-to-sales ratio.

Makes Steel Tougher, Cleaner

This big kettle is something brand new. It's a large vacuum vessel that "boils" hydrogen gas out of molten steel by lowering the pressure (A. Finkl & Sons Company, Chicago). Reason for removing the hydrogen: It's one of the big causes of failure in tools and dies. Microscopic hydrogen gas bubbles in steel start cracks, flaws, and ruptures. Often the flaws can't be detected until cracks show up on the job.

Granted, there are several ways to lick the hydrogen problem in steel, but all are slow and costly. Heat treating has been used for years. And a stream degassing method has recently been developed. But the latter method is limited because molten steel can be degassed only as it is flowing into a single ingot mold from the ladle.

The new batch process developed by Finkl removes gas from a whole ladle. As installed at the Chicago foundry, the big vacuum degassing chamber holds a 75,000-lb. charge of electric-furnace steel in a ladle. When the swivel lid closes, the degassing cycle starts.

First, automatic controls turn on four steam ejector-suction pumps in proper sequence. As a high vacuum is achieved, the hydrogen gas bubbles to the top of the melt and is drawn out of the chamber. Oxygen and nitrogen also bubble out in the turbulent boiling action. Then helium is forced into the ladle. This causes more turbulence—also scavenges unwanted gases.

The whole cycle takes only about 12 minutes. The steel loses very little heat (temperature drops from 3000 to 2850 F.). But Finkl researchers found degassed steel pours at lower temperatures than a regular melt. And tests show hydrogen in the steel is reduced from 3.9 parts per million to 1.5. This 60% reduction is a great aid in producing stronger and tougher steel for dieblocks and forgings.

Takes Big Shock

This graphite throat insert requires rigid dimension checking. It's the sleeve for inside the rocket engine nozzle of the Lacrosse ground-to-ground missile. Graphite is one of few materials able to stand the thermal shock when the temperature zooms up some 5000 F. in a fraction of a second.

In the photo an insert is being checked following precision machining at National Carbon Company's Cleveland plant. Inside diameter is held within ± 0.006 inch, outside to 0.001 tolerance.

CASE BOOK CAPSULES

Era of self-guided buses traveling exclusive rights-of-way and stopping automatically may be near. Chicago Transit Authority just successfully completed tests using battery-powered trucks with electronic devices to determine feasibility of system.

Ceramic-coated car muffler may outlive average car. It lasts for 100,000 miles, costs no more than premium-priced units. To fabricate, Bettinger Corporation (Milford, Mass.) uses a process for protecting jet engine parts.

Translucent glass-like material helps missiles see farther, better. As infra-red radiation passes through, it guides missile. Eastman Kodak Company (Rochester, N. Y.) says material retains transparency at over 1200 F.

Transistor parts smaller than a rice grain are stamped at rate of 1000 a minute by August W. Holmberg & Company (Flushing, N. Y.). Tungsten carbide dies produce at this speed, maintain quality.

Computer rental by the hour will start in 1960. International Business Machines Corporation (White Plains, N. Y.) will establish 25 to 30 Datacenters to handle business —at $300 per hour.

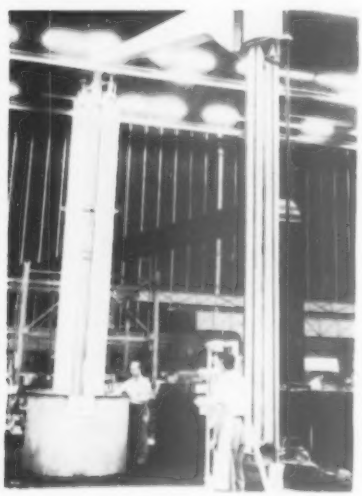
Atmospheric temperature will heat and air-condition Raytheon Company's new engineering lab at Sudbury, Mass. The 160,000-sq.-ft. structure has no furnaces or boilers. Heat-pump system works like a household refrigerator.

"Hot die" press forging, developed by Armour Research Foundation (Chicago), produces parts with more precision than standard forging methods. Also minimizes extensive and costly finishing.

Fast, low-cost soldering technique (Cubic Corporation, San Diego) is used by the Army Ballistic Missile Agency. Eliminates wrapping, twisting or crimping leads and pigtails to terminals.

PROJECTOR SLIDES GUIDE PAINTER

No more "eye-balling" of complicated paint stripes on the sides of aircraft at Bell Helicopter Corporation (Fort Worth). Slides and a 35mm projector outline layout patterns on the aircraft during final painting. The simplified method is credited with a 75% time saving—and does a better job to boot. One man sets up the projector mounted on an adjustable stand with built-in levels, then masks the stripe along a slide-projected image. Previously, stripe outlines were put on by a two-man crew. One man did the stripe painting while the other, standing 25 feet away, lined them up by eye. This was especially tough around curved surfaces.



Chemical Mills Precision Shapes

This isn't a giant dip for huge candles. In fact, material is being removed instead of added. Process is chemical milling. The two shapes hanging from the jib crane are 30-ft. wing spars for a giant transport plane. Chemical milling tapers them down to paper-thin tolerances. Etching chemicals eat away surplus metal in areas that would be difficult to machine.

Here's how the new $100,000 installation at Lockheed Aircraft Corporation's Marietta (Ga.) plant works. The system uses three 30-ft.-deep, 5-ft.-diameter tanks. The first is stainless steel and contains sodium hydroxide heated to 190 F. The second is glass-lined carbon steel and is filled with flowing water at room temperature. No. 3 tank is also glass-lined, but contains air-agitated chromic acid.

A 40-ft. jib boom slowly lowers parts into the sodium hydroxide at a rate set automatically by a variable speed timer. This eats away aluminum at a rate of 0.001 inch per minute. Then the motion of the boom is reversed and the spar removed. Of course, the end longest in the tank is etched the most. Thus the spar emerges with an even taper.

Next the boom moves the spar a few feet to the water rinse and then to the chromic-acid bath, which removes scale. The system is safety-protected so that if there's any malfunction, everything shuts down.

At present, the Lockheed installation mills only aluminum alloys. But research is underway on a pilot plant for handling stainless steel, titanium, and other hard metals.

Alley Recruiting

Bowling-alley recruiting that is. The Faultless Rubber Company (Ashland, Ohio) maintains a separate building for employee recreation—Ping-pong, billiards, a kitchen, plenty of room for social gatherings, and—you guessed it—bowling alleys. Four of them, to be exact, and all official size. They're for employee use during off-hours.

This year Faultless decided to link the recreation center to its employee recruiting program. Idea was to let townspeople see the recreational facilities and sample the company spirit. The bowling alleys seemed like a perfect bit of honey to draw the local crowds. Ashland is a city that likes its bowling—has a bowling association connected with the American Bowling Congress (ABC).

A tournament was set up on the company alleys. It was open to all members of the city bowling association. All entrants had to hold ABC cards. Registration fee per team was $15 with all money going back to participants in the form of prizes (after tournament expenses). At least one prize was available for every 10 entries. Top team prize was $300.

Company alleys were reserved at certain times during the day and evening for tournament competition. Company bowling was discontinued during these times, but Faultless employees could bowl as members of tournament-sanctioned teams. Provisions were made to serve free coffee and doughnuts to participants. Other recreational facilities in the building were also open to outsiders who were waiting their turn to bowl. This made it possible for them to look over the complete off-duty facilities for employees.

Two important public relations features are incorporated in the

program. During tournament competition, Faultless employees visited with outsiders while the visitors were able to see at first-hand the excellent recreational facilities provided by the company. In addition, because the program was a public service, it got generous publicity.

The company felt the project would be self-sustaining through the entrance fee paid by each team. But it was prepared to subsidize to insure complete success for the undertaking. Fees were used primarily for the tournament awards. Public relations, secretarial, mailing, and other administrative expenses were underwritten by the company.

About 1000 local citizens came in contact with Faultless employees, the company, and its facilities during the six-week tournament. That's a lot of goodwill for a company in a smaller town.

Source: Jack Harris, Personnel Director and Howard Honaker, Recreational Director, Faultless Rubber Company, Ashland, Ohio.

RECRUITMENT OFFICE ON WHEELS

Recruitment got off to a flying start at the construction site of Rayco Manufacturing Company's new headquarters in Paramus, N. J. Before the building was ready for occupancy a 29-ft. trailer rolled up and interviewing of prospective employees started. This was how new hires got their first impressions of the company. On the whole, impressions were favorable. The trailer was fully equipped as an office—contained a waiting room, a testing room, and a private office. And the Recruitmobile doesn't have to stand still waiting for applicants. It can visit nearby towns looking for likely future employees.

Cuts Cycle 50%

This portable hydraulic punch does a neat job of putting 625 holes in aircraft fuselages. But there were still some problems in operating it. The punch had to be in perfect alignment with a ½-in.-thick structural steel bolt ring that holds fuselage sections together. If it wasn't, the die would stick in the hole. In this way an average of two dies were broken per plane.

Then two alert aircraft assemblers at Ryan Aeronautical Company (San Diego) came up with a neat solution. They added an aluminum alignment block that cut operating time 50%. This helps in retracting the die from the hole. It holds the punch square against the bolt ring and lets die retract from hole when hydraulic pressure is released.

Originally the punch operator held this block in place with one hand while he handled the punch with the other. This meant his fingers could get caught under the die or between die and block. A spring clip to secure the block in place eliminated this. Result: both hands free to operate the punch.

Computer Handles Complex Inventory

The Atlas missile is going to have a computer to look after its parts inventory. At Convair's Astronautics Division, General Dynamics Corporation (San Diego), the computer handles this complex supply problem. Convair will turn the system over to the Air Force when the project becomes operational.

Over 40,000 parts go into every Atlas. But the inventory control problem is even bigger than this figure suggests. Because the missile is still in the research and development stage, refinements occur in almost every one. It's like trying to supply parts to an automobile manufacturer who changes models.

Most distinctive feature of the IBM-RAMAC computer system is its memory file—50 large magnetic disks arranged vertically. They rotate at 1200 rpm., can turn up needed facts in no time at all. The Atlas machine uses two such files. They're always up to date.

As parts are added to and taken from inventory, the machine updates the record. When Convair wants information about a part, it just asks the machine by punching five keys. The answer comes out on an electronic printer in five seconds. The IBM-RAMAC will inventory items at all Atlas test bases and launching centers, will determine the usage rate for parts, reduce the number of rush orders, automatically re-order parts before stock reaches critical levels.

Want Your Name on This Board?

Want to be Mr. Cost Improvement? It's a position of real honor at General Electric's West Lynn plant. Means you're the cost-reduction leader in the general plant utilities section. But if your department doesn't meet its cost-improvement budget, you're represented lower down on the bulletin board (photo) by a "man in the doghouse."

The program works like this: Four service departments participate—utilities, plant engineering and construction, plant protection, and purchasing. Each has a cost-improvement budget. Each department's progress in meeting budgeted goals to date and during the previous month is shown by a picture under the section's name in the two rows at the bottom of the bulletin board. Meeting the budget gets you a "proud man" photo; falling behind, a "man in the doghouse."

"Mr. Cost Improvement" is the man from these departments who has accrued the greatest dollar value of cost reductions for the year to date. His name appears at the top of the plaque. Below is the past month's leader. To the left goes the name of the person with the greatest number of cost-reduction incidents. "C.P.", at right, stands for Cost Preventions based on a point combination of number and dollar amounts of cost preventions. Each cost prevention counts three points with an added credit of one point for every $1000 value.

A cost improvement coordinator administers the program. Posters in each department tell how everyone is doing month by month. To date all departments are well under their budgets. And recently two subdepartment managers received award certificates in recognition of 100% participation by their people.

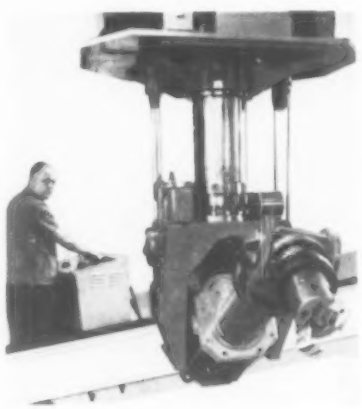
Source: J. J. Cox, Cost Improvement Coordinator, General Electric Company, West Lynn, Mass.

Bingo for Safety

With each copy of the company house organ, employees of Lehigh Structural Steel Company (Allentown, Pa.) found—of all things—a bingo card. On the back of each card, the employee's name and a numbered list of 75 safety slogans.

Every day thereafter a safety slogan was announced twice. It was also posted on bulletin boards. If the code number of the slogan appeared on the bingo card, the employee circled it.

First employee to fill a vertical, horizontal, or diagonal line won a $25 U. S. Savings Bond. First one to form a cross (for the green cross of safety) won a $100 bond.



Strong Arm Has the Light Touch

This muscular manipulator lifts up to 5000 pounds. It's one of the largest and most powerful mechanical arms ever built. And it can handle small pieces with dexterity and precision. The Mechanical Division of General Mills' Nuclear Equipment Department (Minneapolis) built it for the University of California's Los Alamos Scientific Laboratory. It will be used on Project Rover at the Atomic Energy Commission's Nevada test site.

Reactors for developing nuclear propulsion in rockets will be disassembled by the machine after testing. Reactor components can thus be examined for the effects of testing without subjecting workers to danger.

Remote handling of parts is a "must" because of high radioactivity. The arm does the work while the operator directs from a safe distance. A remote-control panel allows the operator to manipulate the arm as if it were his own. Motion is controlled by airplane-type joy sticks on the panel.

Town Saves Plant

Evans Products Company needed an additional 42,000 square feet of warehouse space to make its West Branch (Mich.) toy plant meet its needs. The company planned to move out of the town. It leased—but didn't own—it's 40,000-sq-ft. manufacturing plant in West Branch. At stake for tiny (2100 pop.) West Branch: more than 100 jobs.

The company couldn't figure a better way to solve its space problem. But the town did. And there's a valuable idea here for any small company with a similar space problem. Here's what happened:

A small group of local business leaders talked to company men, learned Evans would stay in town if arrangements could be worked out. Next the businessmen visited nearby banks, soon had a commitment for a $260,000 loan on the building leased by Evans and a proposed new building to supply the warehouse space. But the bank stipulated the townspeople would have to finance the project partially with $100,000 worth of 5% debentures.

The West Branch Industrial Committee was organized to issue the debentures, purchase the existing building, build the new one. The company agreed to purchase the enlarged property on a 10-year land contract. Thus company payments would retire the loan and debentures with interest in 10 years. When the debentures were issued, they were all sold in less than two weeks.

Payoff for company: needed facilities in a town that wants them. No need to train a new workforce.

Payoff for the town: 100 jobs saved, 150 new jobs added.

1. MINUTE MAN MAKES MAINTENANCE MOVE.

2. TOUGH TIRES TURN TRICK.

3. SPEAKER SAVES SUPERVISOR'S STEPS.

4. LEANING LADDER LESSENS LUGGING.

Do-It-Yourself Ideas Whack Hard at Costs

Every plant has dozens of good cost-cutting, trouble-saving tricks. Many work so well that everyone takes them for granted. They may not be very elaborate or expensive—just a new twist on an old kink or something home-made. Here are four such ideas from The Timken Roller Bearing Company, Canton, Ohio. Maybe you'll be able to use one or more of them in your plant.

1. Minute-man pick-up and delivery of supplies and tools helps boost efficiency of Timken's maintenance department. A light truck covers pre-selected stations on a regular schedule at the sprawling Steel and Tube Division plant. The driver picks up a requisition for tools or supplies on one round, delivers the order next trip out. Crews used to send a man back to the maintenance stores department. This took valuable time that could have been better spent on repair work.

The round robin keeps truck and driver busy for about half the day. The rest of the time they're free for special calls or other service. A pick-up truck was chosen for this operation because it can get in tight places. Small, high-usage parts and tools are carried in a tool box. A small hoist on the truck body helps unload heavy parts. A two-way radio provides instant communication. And for extra convenience, a sonic whistle in the cab opens doors automatically without the driver's leaving the wheel.

2. Tough tires are a special feature of this shop tractor in the screw machine department. Tires can't puncture or blow out because they're solid. Timken sandwiches old pneumatic tire castings together in the shape of a wheel. The fabricated tire is flexible enough to give a good ride, has excellent grip on slippery floors, and is immune to damage from sharp metal scrap in the shop.

3. Step-saving speaker connects 12 strategic stations in noisy rolling-

mill areas. Men in the office, at the heater stations, or at the rolls can talk without running back and forth across the shop. A worker at any station may reach any of the others by pushing a button. Each unit has a speaker, microphone, and set of station selector buttons.

4. Leaning ladder takes a lot of labor and danger out of refueling locomotive cranes. Fuel travels up the pipe attached to the side of the ladder, is fed into the crane by a nozzle at the top. The counterbalanced ladder tilts over to the crane roof so the trainman can safely step over and fill tank. The job once was a tough one—required the fueler to climb up the ladder at back of the crane, dragging the hose with him.

Outside Is Safer

Erect it outside, then bring it in. That's what Clinton Corn Processing Company did at its Clinton (Iowa) plant when it needed a new continuous-process oil extractor. Why not erect the 40-ton unit inside? Because welding near existing units, using highly explosive hexane as a solvent, wasn't safe. And these operations couldn't be shut down.

During the outside assembly, parts were first put together on a temporary foundation of 55-gal. drums filled with concrete. Then hydraulic jacks lowered the completed unit onto four heavy-duty 8-wheel dollies designed for remote-control steering. Finally, a heavy cable and winch on a truck pulled the 14-ft.-high, 24-ft.-diameter extractor through a hole in the wall of the building and maneuvered it into the right position. Result: Job was completed without an accident.

Bootery on Wheels

This isn't an ordinary shoe store. It's the interior of a rolling shoe shop that recently brought safety shoes to the doorstep of the Thompson-Ramo-Wooldridge Valve Division plant in Cleveland. First time around for the bootery-on-wheels, over 260 workers made purchases. Thompson is so pleased with the acceptance of the idea by employees that it has arranged for visits two or three times a year.

Webb Industrial Plant Service of Norwood, Ohio, provides the service. It operates four Shoemobiles to serve plants within a 500-mile radius of Cincinnati. The one that visits Thompson is housed in a 35-ft. semi-trailer and tractor that cost $22,000 to outfit. It shelves a stock of 2000 pairs, is air-conditioned, boasts glass store-front doors in back. Webb started its service with just one truck. Though business has expanded greatly, service is limited to the Midwest.

The idea is a big help to a company safety program. The truck provides on-the-spot, job-needed shoes, helps create interest in wearing them. Employees like the service because there's a big selection of styles. Fitting, done by experts, insures maximum comfort and safety. It also gets plants out of the shoe business, eliminates the investment in a shoe inventory, and frees valuable floor space. Before arranging the visit, Thompson made sure it would not be taking business away from neighboring stores.

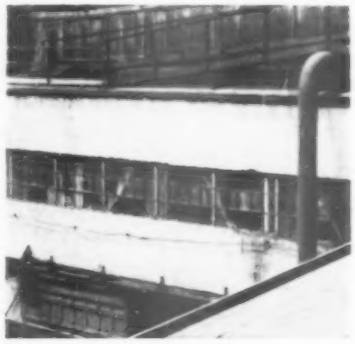
Reprints of the Plant Operating Case Book are available. Price 50c. For quantity prices write Reader Service Department, FACTORY, 330 W. 42nd St., New York 36.

YOU BE THE ARBITRATOR

Continued from page 150

The award—The arbitrator ruled in favor of the company. Said he was unable to find anything in the contract to prevent management from combining or changing jobs if it were done in good faith and without imposing undue burdens or hazards on employees. The task added to the machinists' job was not foreign to it. This was proved by the fact that they had actually been doing it for years.

Caution: The award in this case is not an indication of how other arbitrators might rule in other apparently similar cases. Arbitrators do not follow precedents. Each case is decided on the basis of the particular history, contract, testimony, and other facts involved.



Now—a Clean Roof

The big roof on the foundry of General Motors' Buick Division in Flint is a lot easier to clean now, since a series of catwalks, ramps, and platforms were installed. Cleaners shovel dirt in wheelbarrows, then trundle the loads off to chutes leading to dumping bins.

In all, Buick installed 2500 feet of catwalks on the 539,000-sq.-ft. facility. These terminate at three chutes leading to two truck dumping areas—one north of the building, one south. Accumulated sand and dirt must be removed to prevent clogging the drains and overloading the roof with rain water.

Formerly cleaners deposited roof dirt in buckets, then carried them up and down ladders to dumping bins. These bins were emptied periodically into trucks.

USERS OF **NEW** **ROEBLING HERRINGBONE* WIRE ROPE** HOLD THESE TRUTHS TO BE SELF-EVIDENT...

That Herringbone is the most practical and *needed* wire rope development to come along in years.

Herringbone, the regular lay and Lang lay rope, is actually two-ropes-in-one rope. Thus, the qualities that make these two ropes *good* ropes, combine to make Herringbone *excellent*.

HERE'S WHY:

The steel core of Herringbone provides the *ideal* support for the two pairs of Lang lay and one pair of regular lay strands used in its construction. In addition, the outer wires are heavier for extra abrasion resistance, and good flexibility is maintained by the finer wires inside. This combination of features enables Herringbone to give *longer service* in most applications.

Herringbone has been used on a wide variety of excavating equipment and tough hoisting jobs with impressive results. Its applications are practically unlimited on installations which call for all-steel ropes and on many where fiber core ropes are now being used. Another of Herringbone's added attractions is the fact that it eliminates the necessity for stocking Lang lay rope for one job and regular lay for another.

Your Roebling Distributor has Herringbone right now. He has, also, copies of a brochure describing Herringbone, the newest Roebling Star Performer. If you wish, write Wire Rope Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey, for literature and anything you'd like to know about Herringbone.

*Reg. App. For

ROEBLING

Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation

HERRINGBONE
WIRE ROPE

For more facts Circle 535 on Reader Service Card

ROSS
Air Systems

Engineered Atmospheres
for Better Processing

Ross foam rubber curing oven

MODERN

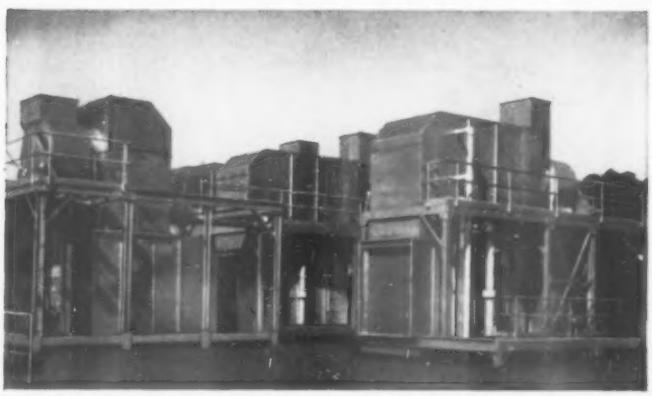
THE ANTIDOTE FOR A POISON

The poison? Obsolescence! The use of a machine that is past its 'point of no return' may not show up too strongly in your unit cost structure now but its cumulative effect is devastating. It's slow poison... slowly sapping the production strength of the user. The longer an obsolete unit remains in service the greater is the unit cost gap between the old and what a modern unit would do. If you have obsolete

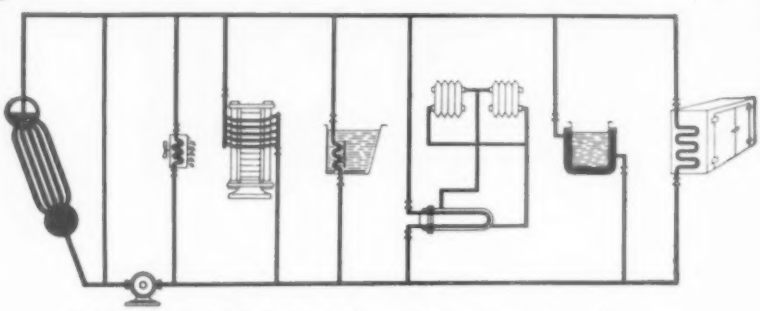
OPERATIONS WHERE MODERNIZATION WILL PAY OFF!

Paint Finishing
•
Washing, Drying, Baking, Curing
•
Conversion Operations
•
Process Heating
•
Air Heating
•
Air Distribution; Fans; Ducts; Nozzles
•
Industrial Air Conditioning
•
Heat Recovery

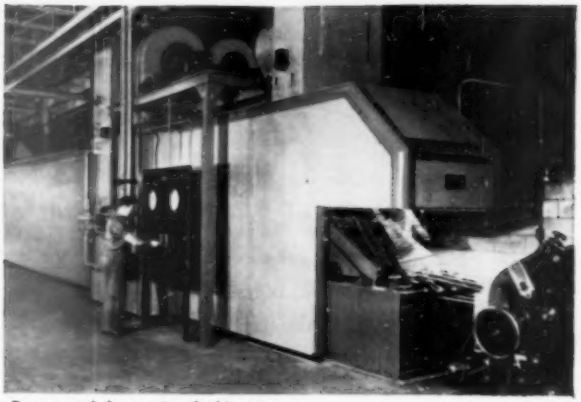
Any process that needs its components brought up to date so that they conform to the modern practices and make use of the latest in design.



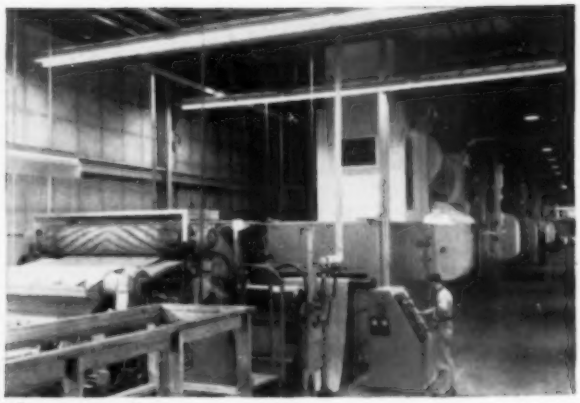
Ross-Briner economizer; aluminum construction for roof installation



Schematic layout of typical Supertherm high pressure water system to replace *uneconomical* existing process and comfort heat system



Ross metal decorating baking oven



Resin core stock oven

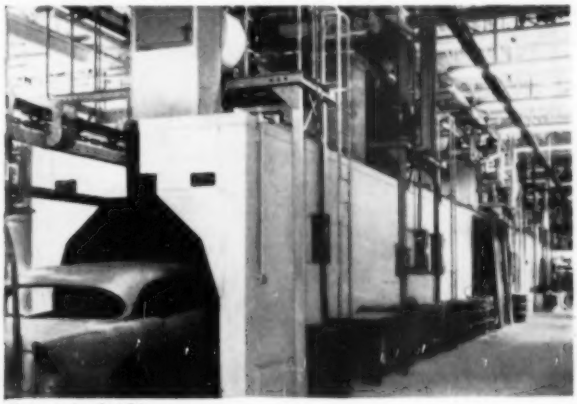
IZATION

AFFLICTING MANY COMPANIES

equipment you are in a slowly deteriorating competitive position.

Why not check all operations in your plant that directly or indirectly involve what we call the 'Engineered Atmosphere'? Ask a Ross Specialist to make a study of the systems, equipment and auxiliary units to determine just what *is* obsolete. He will submit a detailed report as to which should be modernized to bring about the greatest reduction in unit costs. His report will be based on his broad knowledge of 'Engineered Atmospheres' and years of experience in designing the equipment and systems noted in the accompanying list.

Ross core curing oven (foundry)



Ross paint finishing oven

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For more facts Circle 536 on Reader Service Card

FACTORY

IDEAS OF THE MONTH

By LEWIS K. URQUHART, Consulting Editor

(For more information, circle item numbers on Reader Service Card next to back cover)

When you brighten plant interiors or exteriors, better consult a new 21-chip color chart *(Carboline)*. Shows comparative pigment resistance to acids, alkalis, oxidizing exposures, weather—plus approximate cost percentages. **(291)**

Thrifty Scot is a brand-new electric lift truck *(Smith)*. Two models: 3000- and 4000-lb. capacities. Turning radius: 52 inches. All controls on underside of top cover for quick and easy maintenance at eye level. **(292)**

You're sure of safe, convenient placement of maximum number of cars if you plan your parking lot with the help of a set of layout templates *(Maintenance, Inc.)*. They provide for 45-, 60-, and 90-deg. parking. **(293)**

Good news for material handlers: One-piece box *(National Vulcanized Fibre)* collapses for return or storage in 6 in. of original height. Reason: Piano-type hinges connect side panels, end panels, lid, and base. Sheet-steel stacking base permits fork-truck handling from all four sides. **(294)**

Still smearing pipe threads in your plant with messy lead and oil dope? Your maintenance men will go for a new dry tape *(Chemtrol)*. It's Teflon. One turn around thread and you get an effective seal. **(295)**

Nu-Air is a 7-lb. purifier *(Eaton)* that makes bad air good in smelly quarters (your inside conference room, for instance). Plastic filter can be washed clean in cold water—in seconds. **(296)**

Warm employees, warm equipment, warm materials, warm floors! Infra-red gas heaters *(Perfection)* bring you controlled heat in any building—without air movement. And save fuel dollars to boot. **(297)**

No more fumbling with paper plates during cafeteria rush hours—thanks to that hot-off-the-line dispenser *(Dixie Cup)*. Rubber suction cup on dispenser arm grabs top plate only and lifts it from stack in barrel. **(298)**

Note to work simplification fans who find it pays to take before-and-after shots: You can kiss lighting worries good-bye if you're using 3000-Speed, Type 47 film *(Polaroid)*. It's 15 times faster than the old Polaroid. Try it with a "wink light" for best results. **(299)**

With winter just around the corner, now's the time to consider that powered wheelbarrow *(Prime-Mover)* with snowplow attachment. Fill the 10-cu. ft. bucket with sand—and you're in the snow-removal business. **(300)**

Second chance for those who failed to get a copy of "100 Ways to Cut Material Handling Costs" *(Manpower, Inc.)* when we announced it a year ago. It's still yours for the circling (see Reader Service Card). And, like so many other good things in this life, it seems to have improved with age. **(301)**

Add Rapisteel slotted angle *(Rapids-Standard)* to your list of do-it-yourself building materials. It's a quick answer to such everyday problems as storage racks, work stands, maintenance platforms, etc., etc. **(302)**

High-speed-tool tippers will do well to give Crumcoid welding compound *(Crumpton)* a good try. One of our more reliable spies says it gives you the solid weld you've been looking for. **(303)**

Basic Circuits is a 32-page booklet *(Automatic Electric)* designed to serve as a guide to determine availability of a circuit and its components. Line drawings show relay transfer trees, relay coil symbols, relay coil terminal connections, slow-operating and self-releasing circuits, etc. **(304)**

Plastic totebox made of a high-impact polymer *(Seiberling)* looks mighty good to us. It's lighter than metal or wood. Won't rust. Doesn't ever have to be painted. Has no sharp edges. And is non-toxic. **(305)**

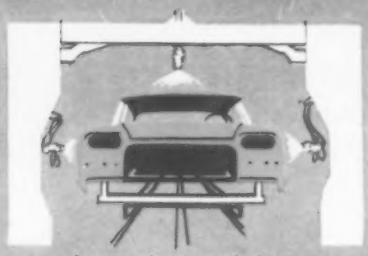
Aluminum storm windows can now be had with weatherstripping made of Acrilan *(Chemstrand)*, which absorbs less moisture than conventional materials and doesn't lose its resiliency, hence lasts longer. **(306)**

Every material handling library should own a copy of "Pre-Bilt Sectional Belt Conveyors" *(Link-Belt)*. These conveyors (in four belt widths) are pre-engineered and shop-assembled from matched components. With handbook (40 pages) in hand, selection of equipment becomes a breeze. **(307)**

Brainstorming kit *(Marketing Communications)* will help you get your sessions off the ground, start a flow of ideas that will quickly repay its moderate cost. Package includes 60-frame film strip in full color, 12-in. record (manual and automatic signal), easy-to-follow instruction guide. **(308)**

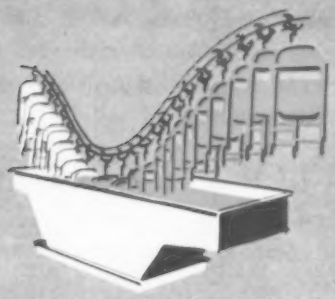
Workers who have to wear gas masks, hose masks, air line respirators will get solid comfort from new facepiece *(Mine Safety Appliances)* with single wrap-around lens. It doesn't fog up. Has improved speaking diaphragm, built-in accommodation for prescription glasses. **(309)**

More Ideas of the Month in Press Time Report following page 70

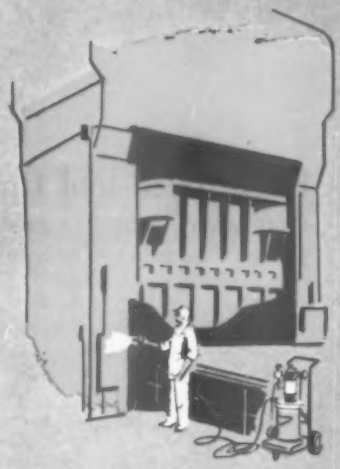


Automatic car painting

Fiberglass boat fabrication



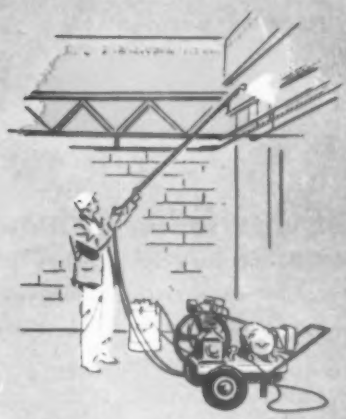
High production coating of metal furniture



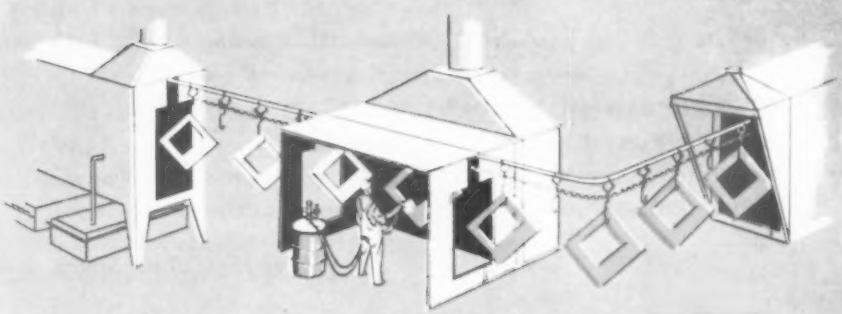
In-plant painting of bulky machinery

Quality finishing with built-in sales appeal

Spray insulation and corrosion protection



Fast, efficient plant maintenance painting



Complete systems for surface preparation, finishing, drying

FOR BETTER SERVICE, BUY

DEVILBISS

THE DEVILBISS COMPANY

TOLEDO 1, OHIO

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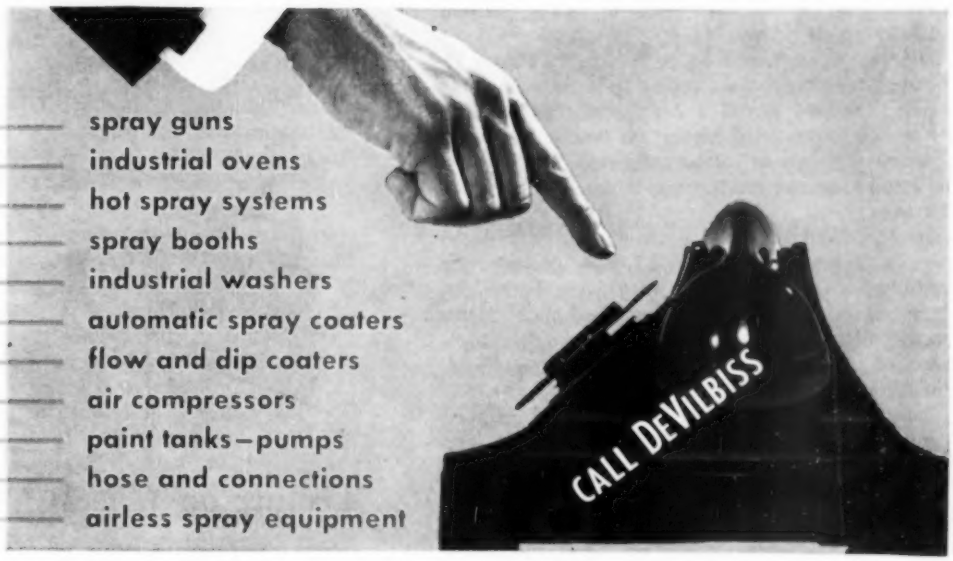
São Paulo, Brazil

Branch Offices in Principal Cities

MANAGEMENT OBJECTIVE:

Determine best method and equipment for surface preparation and coating

ACTION: **Contact DeVilbiss**



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For more facts Circle 537 on Reader Service Card

By GEORGE A. HOY, JR., Industrial Management Editor, FACTORY

Best Workers, Least Safety

The Ohio State University researcher carefully observed the workers in the plant. He kept an accurate tally of each man's violations of safe work practices. Then he asked the foremen and assistant foremen in the plant to rate their men in terms of their individual productivity.

The results, reported by Researcher Thomas H. Rockwell, certainly don't support the famous safety slogan: "A safe job is a highly productive job." The workers who rated highest on productivity were the worst violators of safety practices. The workers who rated lowest in productivity violated safety practices least.

Dr. Rockwell observed each worker at random intervals 25 times per day for 23 days. None of the assembly-line workers knew they were being observed. Unsafe acts he tallied included such safety-director ulcer producers as working with tools underfoot, not using safety glasses when required, running, and using damaged tools.

The percentage of time the workers were engaged in unsafe practices ranged from 5% to 30%. The average was 17%.

Researcher Rockwell blandly sums up his findings. Says he: "Some risks may be required for workers to be highly productive."

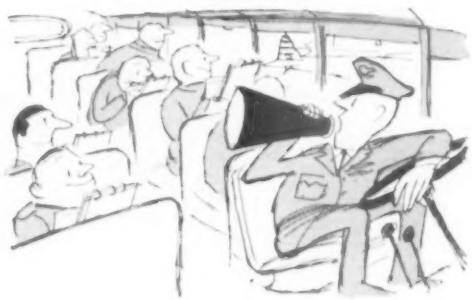
Your Skills in Demand

Industry will need more than 5600 executives in the next six months. And of the total, the biggest single demand (26%) is for manufacturing-production men. This happy news on the job market for FACTORY's readers comes from Executive Manpower Corporation (New York). It's based on a survey of the nation's business corporations.

Below are some other findings of the survey. They apply to all 5600 executives found to be needed, not to the manufacturing openings alone. But you can assume that the results for the total approximate those for the manufacturing-production executive needs of the businesses:

- More than half of the openings will be newly created positions rather than replacements for existing positions.
- To find the needed executives—for replacements or for new positions—companies will start their search for talent within the company. Next, they'll try advertisements and personal recommendations of employees. Third, they'll use management recruiters. And finally, they'll try the employment agencies.
- Companies pay their executives a salary plus a bonus in 35% of the cases. A straight salary is paid by 19% of the companies. Other methods include: salary plus merit raise, 17%; salary plus stock option, 12%; and salary plus deferred payment, 5½%.
- This need for managerial talent exists despite the existence of a management development program in most of the companies.

Conclusion: You're valuable—and needed.



Lecture on Wheels

"Sorry," drawled the voice on the other end of the phone, "every classroom is booked solid."

This left instructor George Holanik with a fine dilemma: where to put the new employees scheduled for his orientation lecture. George tells new workers about security, safety, and employee services at Convair Astronautics Division of General Dynamics Corporation. In this case the workers are Convair employees who have reported for civilian duty at Vandenberg Air Force Base.

George's problem finally was solved. And in a unique and effective way. The makeshift classroom had comfortable seats, windows on all four sides, even a motor under the hood. It was an Air Force bus. And employees got a tour of the facility with their orientation lecture.

Groundhogs Can't Climb

"You can't be a high flyer (do high work, that is) if you've had coronary disease or other limiting illness. Sorry, but you'll have to be forever known as a groundhog."

That's how one eastern company informally classifies maintenance and production workers whose duties might take them up a ladder or onto scaffolding. If they've had heart trouble, they're a menace to themselves and others once they're off the ground. Thus the groundhog label—and ground-level duties.

Do the high flyers object to getting a disproportionate number of aerial jobs? Rarely, because they know they may one day be groundhogs themselves.

Why Cafeterias Fail

Is your cafeteria conspicuously vacant at noontime? Losing more money than it should? Maybe you'll find the reason in the complaints of restaurants eaters. They spoke up against sloppy housekeeping in a study of the restaurant industry made by the Linen Supply Association of America (Chicago). Here are the most common complaints:

- Dirty cloth used to clean the counter or table.
- Washroom dirty and unpleasant.
- They came along to mop while I was eating.
- Waitress was wearing a dirty uniform.
- Waitress uniforms were wrinkled, didn't fit.
- The cook was wearing a dirty uniform.
- Cook had dirty hands.
- Wiped a glass with a soiled rag.
- Washed the floor with strong-smelling soap.

This last item was especially objectionable to women. Of those who noticed it in a restaurant, 37% never went back.

Better Living for Workers

It's obvious that the American worker's standard of living has changed dramatically since 1875. Just how radical a change is revealed by a new U. S. Department of Labor publication, "How American Buying Habits Change" ($1 per copy, Superintendent of Documents, Washington 25, D. C.).

Here are some highlights:

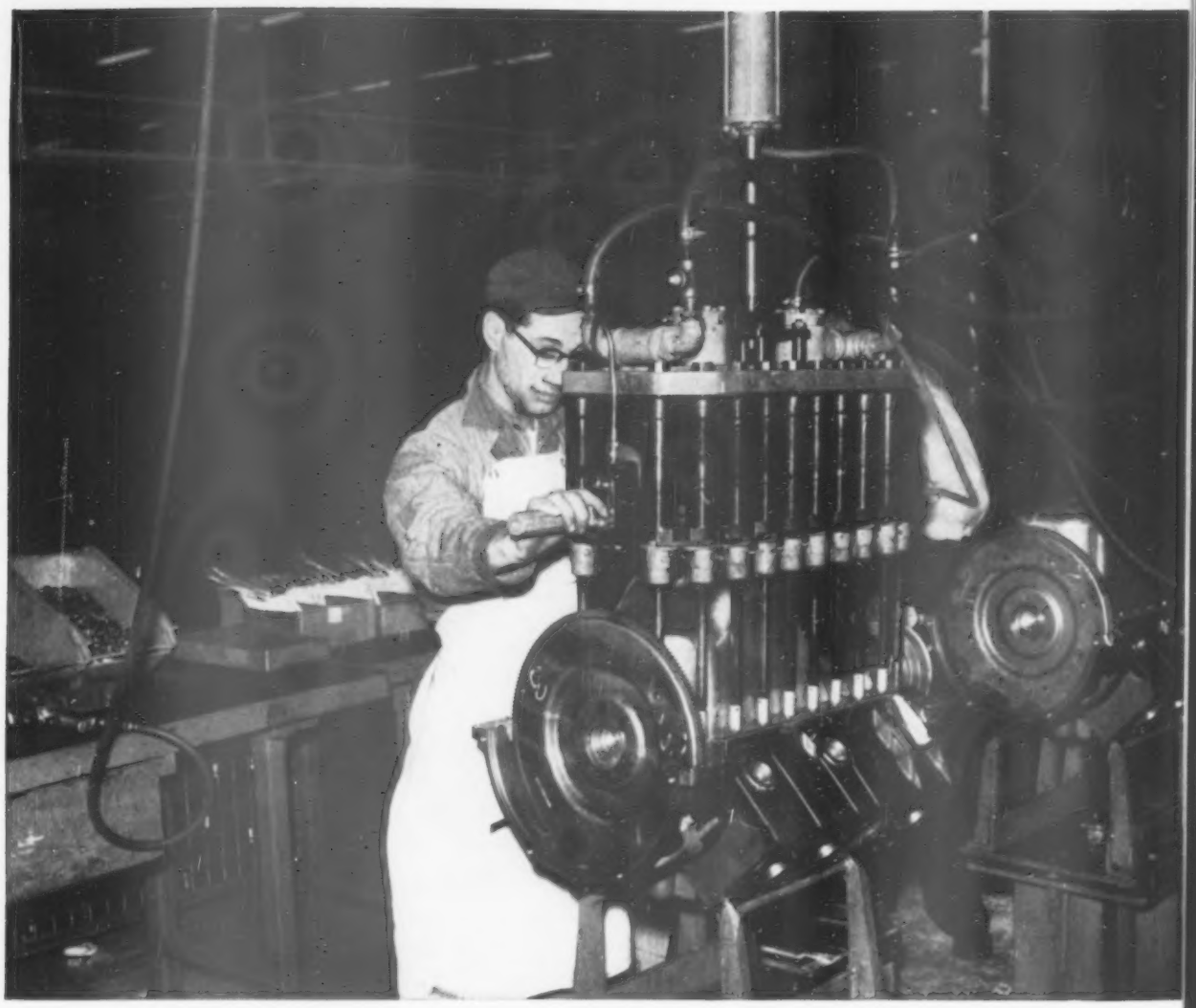
- The purchasing power of wages and salaries of average city workers, in terms of constant-buying-power dollars, is roughly three times as great as at the start of this century. This does not include income from today's fringe benefits, such as sick leave, paid vacations, hospitalization.
- In 1901 the average city worker family spent 43¢ out of each dollar for food. The proportion had dropped to about 30¢ in 1951. Similarly the amount spent on shelter dropped from 24¢ to 15¢, and for clothing from 13¢ to 12¢. But it increased from 20¢ to more than 40¢ for such items as transportation, medical care, and recreation.
- With the shortening of the workweek by 15 to 20 hours since 1900, the wage earner today has greater leisure for hobbies, sports, education, and travel, as well as more money with which to enjoy such pursuits. His car and the nation's improved roads offer increased mobility.
- Three-fifths of the nation's dwellings, excluding farms, were owner-occupied in 1956, against half in 1950 and three-eighths in 1901.

Baronial Bosses Won't Do

The facts on American buying habits (above) lend double impact to an incisive treatise on "The Outlook in Industrial Relations," by Dale Yoder, specially released by his colleagues at the Industrial Relations Center, University of Minnesota. Here's a passage from the paper:

"Some managers . . . seek to create and maintain an industrial status system and bureaucracy in which sole authority flows from ownership as it did in the days of feudalism. They try to reinforce the tottering structure of that system by relating authority to levels of salary. Such managers become frustrated and distraught because employees question their leadership and demand a part in deciding the conditions of employment."

He continues: "Persistence of this traditional viewpoint is tragic because it encourages a basic theory of working relationships that clashes with reality and offends our social sensitivities. It expresses a theory of management and work in which managers rule by divine right and employees work solely to keep the wolf from the door. This combination of authoritarian and subsistence theory is obviously fantastic in a society committed to a choice of jobs for every worker and a minimum living scale that includes tobacco, a family car, entertainment, liquor, and nylon stockings," he concludes.



R/M Homoflex Hose is Strong, Light, Flexible . . . Easier Handling . . . Lasts Longer

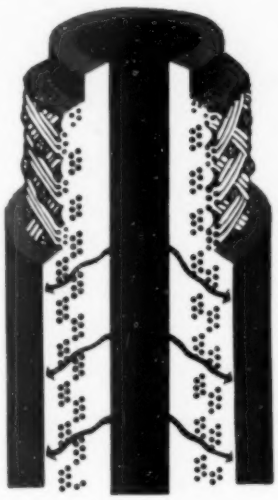
The unique construction of Homoflex Hose adds up to *real* labor and costs savings wherever air, water, and other fluids and gases are handled. It's strong, yet light in weight and "flexible as a rope". Because it's mandrel-made with no pre-set twist, Homoflex coils and uncoils freely in *any* direction *without* kinking! A homogeneous construction, strength member and tube are virtually inseparable, even under the most severe conditions of use around the plant. Mandrel-made also provides uniform inside and outside diameters for faster, easier, *safer* coupling.

Homoflex Hose reduces hose costs because it does a better job and it lasts longer. Ask your R/M representative about Homoflex and other types of R/M hose for factory use. He'll show you why R/M constructions assure "More Use per Dollar" on every job.

For more facts Circle Reader Service Card Numbers as follows:

ONLY R/M OFFERS

HOMOFLEX CONSTRUCTION



- Super-Strong
- Precision Built
- Flexible as a Rope
- Light Weight

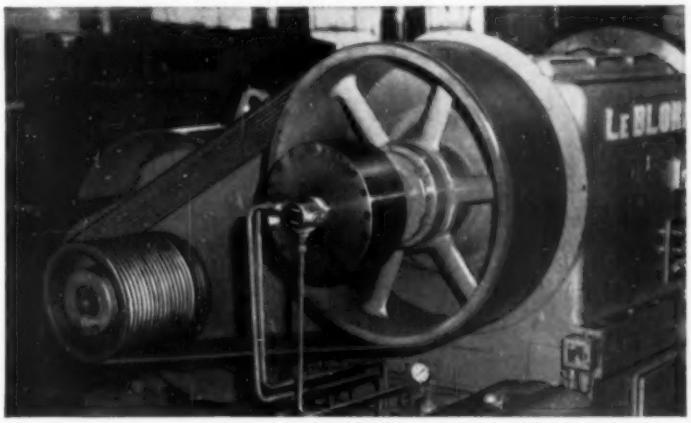
Weighs less than any other hose of equal working pressure.

Note in cross section how specially designed braid permits the rubber tie-gum to penetrate and bond the braided plies during the plastic stage of vulcanization. This results in an inseparable tube-to-cover bond. Write for Bulletins M694 and M610.

"More Use per Dollar"

RAY-MAN CONVEYOR BELT CUTS HANDLING COSTS

Industry's *only* compensated conveyor belt relieves stress of outer plies—both top and bottom—to assure longer life and lower costs for handling bulk materials. Ray-Man troughs easily and trains naturally . . . has the strength and flexibility to carry full loads even where relatively thick, narrow belts are used over small pulleys. Holds fasteners under most severe conditions . . . requires no breaker ply . . . protected against wear, tear, cuts and abrasions with exclusive "XDC" Cover! Write for Ray-Man Bulletin M302 and bulletins on other R/M belts for a wide variety of applications.



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This patented new power transmission drive features a *single, endless* parallel V-ribbed belt running on sheaves specially designed to mate precisely with the belt ribs. The results? The highest horsepower capacity per inch of drive-width yet possible . . . up to 50% *more* power delivery in the *same* space as a conventional V-belt drive—or *equal* power in as little as ⅔ *the space!* Single unit belt design eliminates belt "matching" problems . . . assures constant belt speed ratios from *no* load to *full* load to provide the smoothest running, coolest running—*longest wearing* drive for your power driven equipment. Just *two* cross sections of Poly-V® Belt meet *every* heavy duty power requirement. Write for Bulletin M141.

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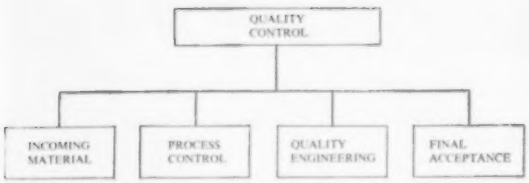
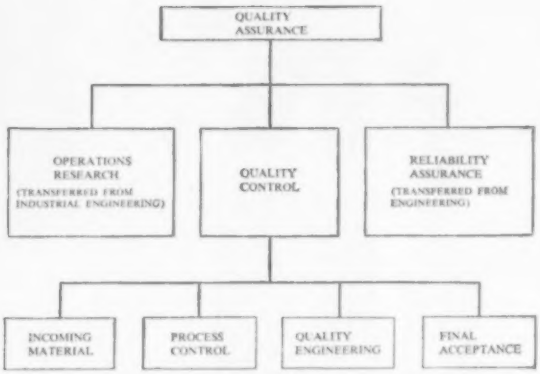
How quality-control organization grows up to meet



Stage 1. Traditional quality-control organization: small and centralized.



Stage 2. Added: operations research, reliability assurance. Centralized.

How to Organize to Meet

Product reliability is today's key word as quality requirements move up and equipment grows more complex. This case history will tell you how this new concept hits plant organization—and what you can do when it comes your way.

THE QUALITY ASSURANCE organization changes shown in the three charts above have taken place over the past two years. In all probability there will be more changes in the next two years, even though the current organization (far right) is working well.

We can speak, of course, only for our own Semiconductor Division of our company (Texas Instruments). We are sure that the specific changes we have made would not necessarily be desirable in other companies. But we are equally sure that change of some sort is in the picture for most manufacturers.

The reason for this is that traditional concepts of quality control are being changed by new and broader concepts of "product reliability." These include all that was meant by quality control, plus a lot more. In our own company we call the new function "quality assurance."

What we used to call quality control is still a vital element, as you can see in the chart above. But we have now consolidated quality assurance, engineering, and reliability evaluation functions formerly performed elsewhere in the company. And we have brought an operations research unit into the picture. Except for operations research we have also had to decentralize all this to meet our specific needs.

What are these needs we must meet? Mainly they are needs that arise out of the enormous increase in complexity of equipment and product that we and many other manufacturers face today. This is basically what has forced us into a clearer definition of quality and into new ways of getting it in practice.

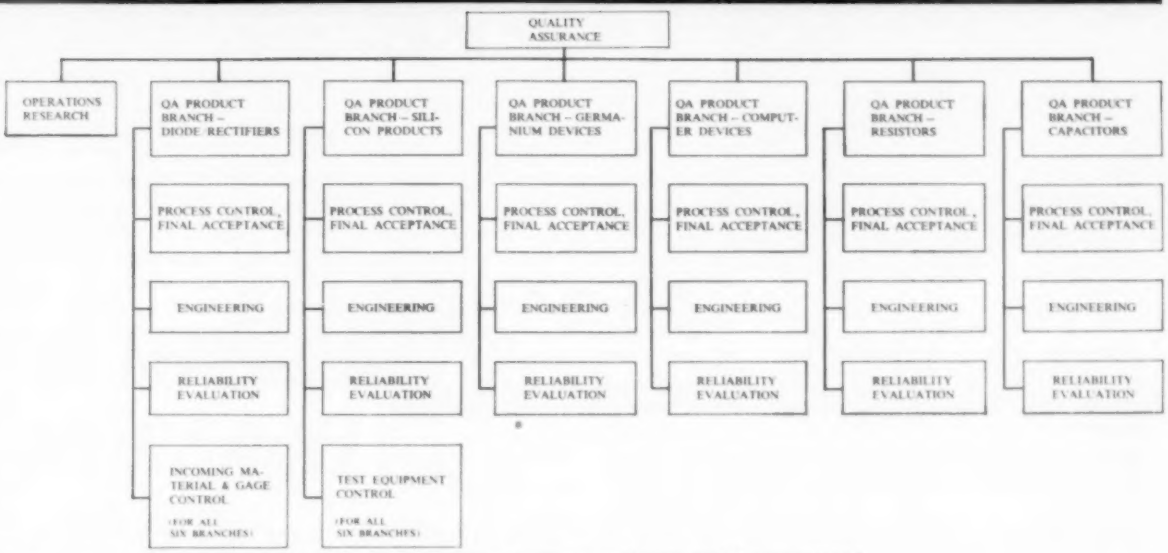
"QUALITY WITH TIME"

Our key word is reliability. This is proportional to the quality of design and of manufacture, and effectiveness of quality control. You might call it "quality with time." To be more formal, you can define reliability as "the probability of satisfactory operation for a specified period of time when used in the manner for which designed." From this definition you can see that brief operating and environmental tests are no longer acceptable criteria of reliability.

Reliability assurance now requires

By T. E. SMITH and
DR. A. W. WORTHAM
Semiconductor-Components Division
Texas Instruments Incorporated, Dallas

today's broad, new concept—product reliability


QUALITY ASSURANCE
OPERATIONS RESEARCH
QA PRODUCT BRANCH – DIODE RECTIFIERS
QA PRODUCT BRANCH – SILICON PRODUCTS
QA PRODUCT BRANCH – GERMANIUM DEVICES
QA PRODUCT BRANCH – COMPUTER DEVICES
QA PRODUCT BRANCH – RESISTORS
QA PRODUCT BRANCH – CAPACITORS
PROCESS CONTROL, FINAL ACCEPTANCE
ENGINEERING
RELIABILITY EVALUATION
INCOMING MATERIAL & GAGE CONTROL (FOR ALL SIX BRANCHES)
TEST EQUIPMENT CONTROL (FOR ALL SIX BRANCHES)

Stage 3. Basically, same organization as Stage 2. But now larger and decentralized. It carries product-reliability concept into every operating branch.

Modern Quality Demands

extensive testing under maximum operating and environmental conditions for 1000 hours or longer.

In many ways this is a new concept. Until fairly recently, quality and reliability were generally defined as conformance to specifications when the product was accepted by the customer. Even military equipment operating under extreme conditions received only pre-production design reliability evaluation. There was little assurance that production models conformed to specifications. In a sense, this was all right. Equipment in this period was less complex, had fewer component parts, usually operated with satisfactory over-all reliability. A failure was not as serious as it is today, when we are dealing with high-speed aircraft, missiles, and complex industrial equipment.

Complexity is the key word in considering today's problems. A piece of equipment that had 50 component parts a few years ago may very well have 1000 parts now. This poses serious problems for all of us, because equipment reliability is dependent upon the individual reliability of the many component parts making up the system. The more components you have, obviously, the more important it is that each be more reliable than in the past.

HOW STAFF NEEDS LOOK

At present, our quality assurance (QA) staff numbers 340. Since there are 5100 employees in the Semiconductor Components Division, the ratio is one QA employee to 15 plant employees. If we count only the 3500 employees in the six product branches served by quality assurance, the ratio is about 1 to 10.

The staff is divided among the six branches in proportion to volume of products manufactured in each. For example, there are 103 QA employees in the Silicon Branch, which serves the largest product department. At the other extreme there are only 12 QA employees in the Capacitor Branch, which has just recently been set up.

In each branch about 50% of the QA staff is in process control and final acceptance. The other 50% of this QA staff is split about equally between engineering and reliability evaluation.

There are 66 graduate engineers on the staff (50 B.S.'s, 14 M.S.'s and 2 Ph.D.'s). In addition, we have between 30 and 40 more employees who have completed at least two years of work toward their degrees and are continuing their course work in night school.

To date we have had no trouble in finding personnel to fill the needs of our still expanding organization, although we now sense for the first time that qualified people are getting scarcer. But this doesn't worry us because the company has a first-rate advertising and recruiting program that can be stepped up. We also have a company-wide training program for current college graduates. If the need arises, we expect we can secure good QA engineers from this source.

Turn the page

We consider staff training to be vitally important, and we do a lot of it. Backbone of this work is a continuous course in advanced statistical methods for all QA personnel. We also invite other engineering employees to attend and participate. In addition, we conduct two courses a year at Arlington State College for members of the Dallas-Fort Worth Section of the American Society of Quality Control.

We feel we have to put a lot more effort into training work now than when we were operating under older and more limited concepts of quality control. The job today is more complex. It demands more from the people involved.

WHO DOES WHAT

We feel that engineering, manufacturing, and quality assurance have joint responsibility for quality control and reliability. We are convinced that maximum success can be achieved only through real teamwork among these functions. Organization charts cannot show this, of course. But rest assured that it is a vital part of our thinking.

One aid to teamwork is the fact that quality assurance, engineering, and production are on the same organizational level. The QA head reports to the vice president in charge of the division, as do the heads of engineering and production.

We think it helps teamwork, too, to locate our QA branches as near as possible to the product departments they serve—preferably in the same area, but in all cases in the same plant. Physical closeness breeds better understanding in this type of work.

The production department is responsible for making all 100% inspections and tests. These are integrated into the manufacturing process and are conducted by production people. Results are fed back on daily detailed reports to quality assurance. In addition, this work is monitored several times daily by QA inspectors on a sampling basis.

Final acceptance of product is quality assurance's responsibility. Inspections and tests are by QA personnel, again on a sampling basis. Rejected product is screened by production and re-submitted to QA.

Quality assurance is also responsible for incoming material inspection. After sampling, rejected material is returned to the supplier, or screened by production under the supervision of quality assurance.

QUALITY VS. COST

It seems fairly obvious to us that a quality organization must be concerned not only with the cost of producing the product, but also with the cost of the quality and reliability effort itself. Given brute force resources, any desired level of reliability is fairly simple to achieve.

Turn the page

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SAVES $25.00 ON EVERY
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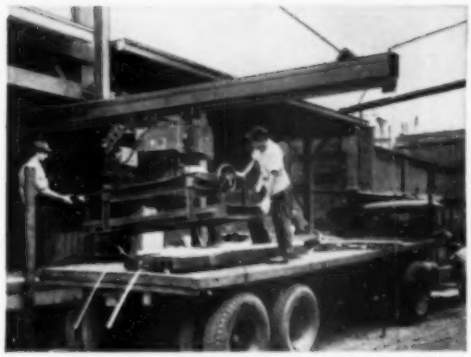
This MonoRail track saves $25.00 every time a truck pulls up! But fast unloading of steel is only part of what **American MonoRail** does here. Materials are carried to storage, to machines and to shipping all by **American MonoRail.**

Let **American MonoRail's** skilled engineers help you develop an overhead handling idea that may save your plant thousands of dollars. Just give us a call or use the handy coupon for more complete information.



Power operated unit unloads steel by pushbutton control.

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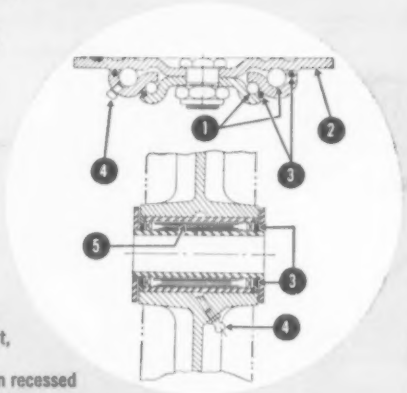

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2. Fork and top plate are both of cold-pressed carbon steel plate for utmost strength at important stress areas.
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Begins on page 168

But the costs could easily devour our profits, and we would not long survive as a company.

This is one of the main reasons for having QA engineering as a key function in our decentralized quality organization. These engineering groups must evaluate the operations involved in manufacturing the product from incoming material to outgoing shipments. They must determine at which point process control can contribute the most to defect prevention, cost reduction, and reliability. To do this they prepare flow charts for each product, showing in detail each manufacturing and quality control operation. As you might expect, this is not an easy job. There will normally be 60 manufacturing and 25 quality-control operations for each product. The operating flow chart must list each operation and its applicable specification. The quality-control points must be defined in terms of detailed QA specifications so that nothing is left to chance.

The whole process calls for a good understanding of cost, as well as sound engineering judgment. For example, take the manufacture of high-volume components such as we produce. It's often more economical to continue processing a known small percentage of defective units that will be detected at a later operation than to try to screen them out earlier. This can be quite accurately determined by a cost-yield analysis of the various operations involved. This same technique is also useful to the quality-control engineer in deciding where process controls will produce the greatest return in yields and quality.

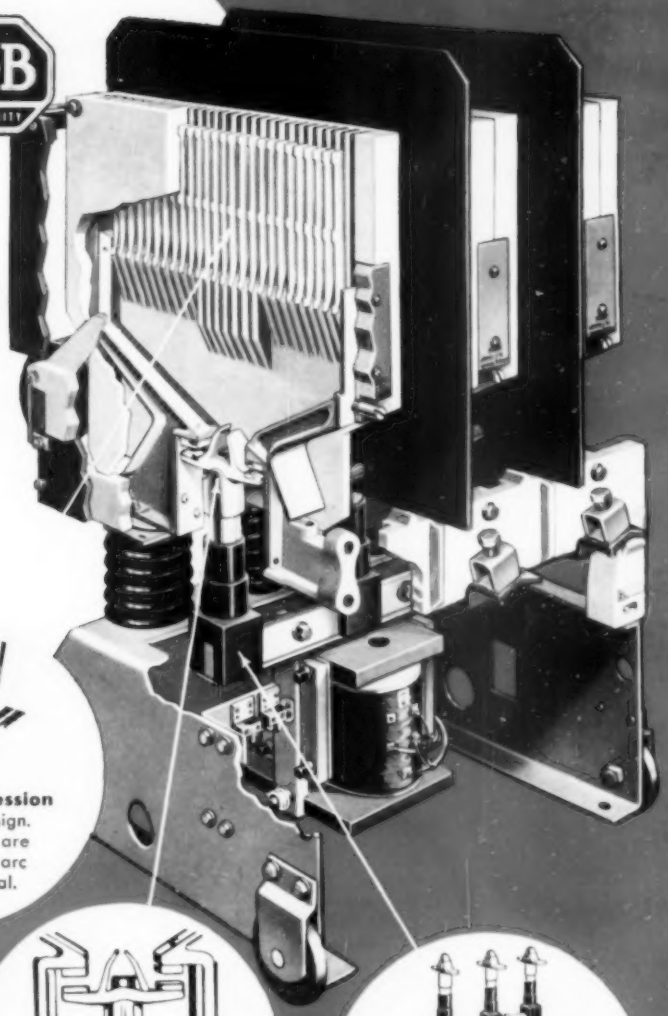
WHAT STATISTICS DO

Modern QA work demands the use of a wide range of statistical tools. We use some for control problems, others for investigation or problem solving. We use both attributes and variables sampling techniques to control all incoming materials. We use sampling in conjunction with control charts for process controls. And we use various forms of more complex experimental designs, regression analysis, and correlation

For more facts Circle 542 on Reader Service Card
For more facts Circle 543 on Reader Service Card ▶

Here's the inside story of industry's

MOST RUGGED HIGH VOLTAGE SWITCH



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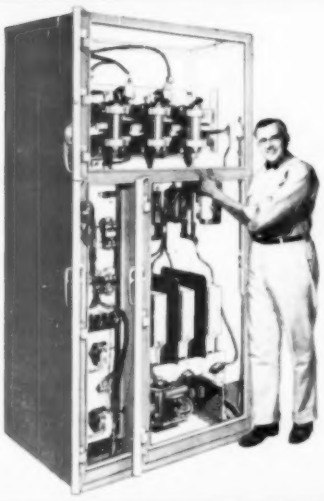
A tremendous operating life has been built into these new A-B high voltage, air break starters by using the same simple solenoid design—with only ONE moving part—that has proved good for millions of trouble free operations in Allen-Bradley low voltage starters. A-B high voltage starters are made for all types of service and for all types of motors up to 1500 hp, 2300 v: 2500 hp, 4600 v. Send for Publication 6080, today.

Faster Arc Suppression
New blowout design. Novel arc chutes are molded from an arc resistant material.

Double Break Contacts
Silver alloy contacts never need maintenance. Vertical motion assures uniform contact pressures.

Only One Moving Part
Simple solenoid design eliminates trouble-causing pins, pivots, and flexible jumpers.



A-B High Voltage Starter with Air Break Contactor

Bulletin 1159 high voltage air break, across-the-line induction motor starter in NEMA Type 1 enclosure. All Allen-Bradley high voltage starters are equipped with current limiting fuses with interrupting capacities of 150,000 kva at 2300 v; 250,000 kva at 4600 v.

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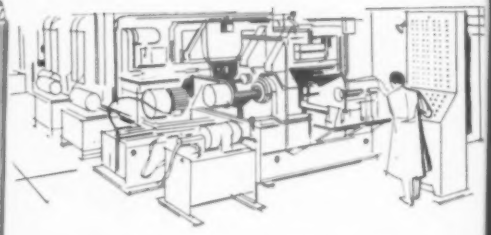
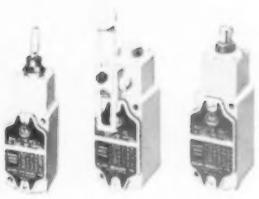


In this broad line of Allen-Bradley accessories, each and every unit carries the traditional A-B trademark of *quality* that stands for trouble free operation. Rugged construction, and maintenance free, silver alloy contacts provide the reliability that is essential to the continuous operation of *your* automatic production machines.

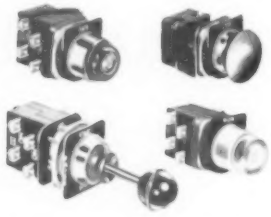
Profit from the experience of the leading machine tool builders . . . insist on Allen-Bradley *quality* motor control *all the way!*

▲ Special push button panels can be assembled to your specifications.

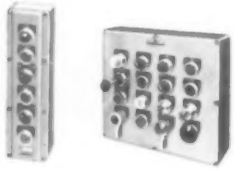


OILTIGHT LIMIT SWITCHES
Bulletin 802T with sealed heads and bodies. Various operators.

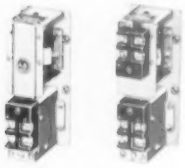
PRECISION LIMIT SWITCH
Bulletin 802 oiltight. Responds to very small operator travel.



OILTIGHT CONTROL UNITS
Bulletin 800T. Choice of push buttons, lights, and switches.



OILTIGHT CONTROL STATIONS
Bulletin 800T for up to 16 units in die cast aluminum enclosure.



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Bulletin 805. In rugged die cast housing for toughest service.

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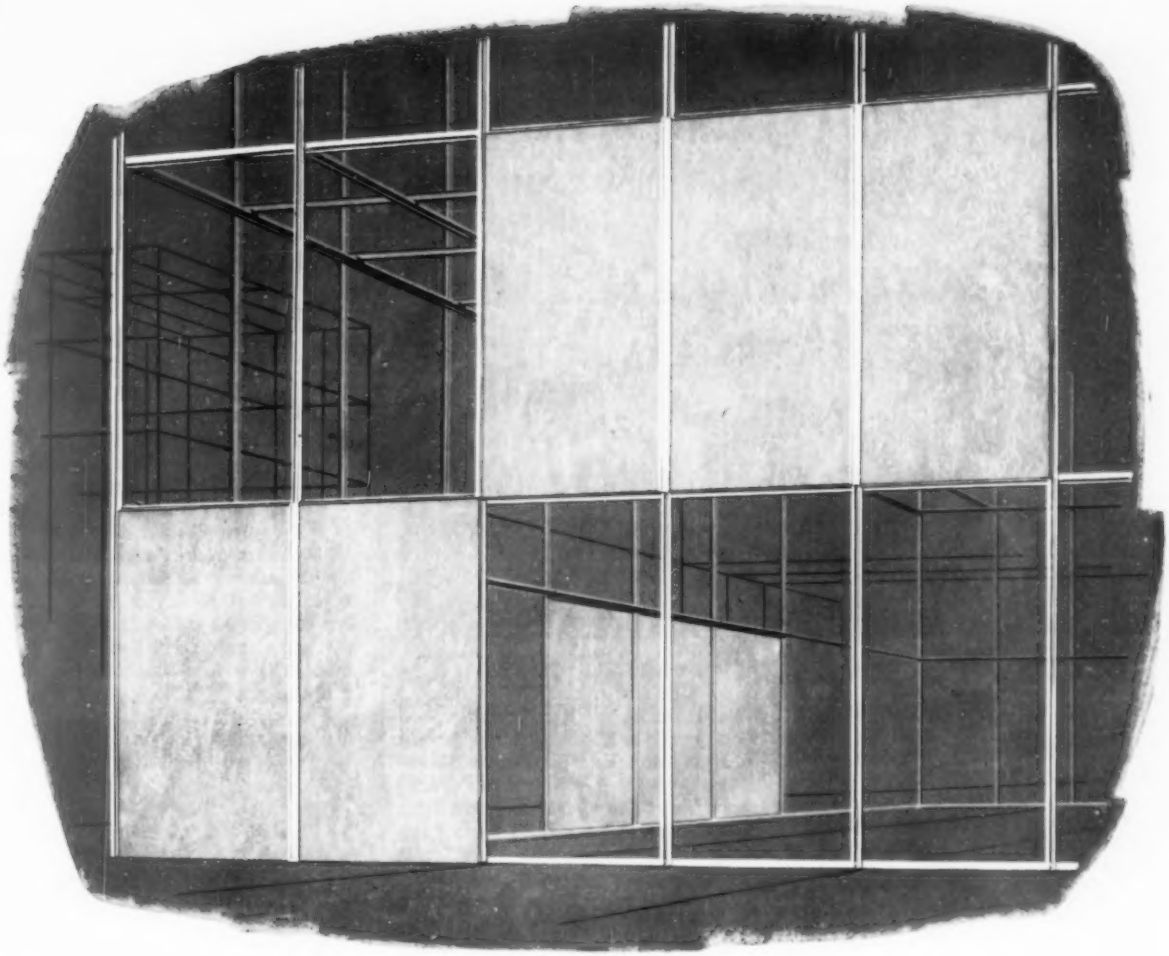

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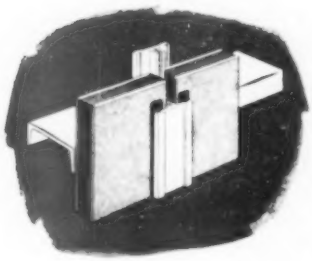

The above H & B aluminum molding is one of several attachment systems that may be used with Transitop.

Here are modern panel curtain walls that provide unusual durability and at the same time can save erection time and money.

Transitop panels are big—4′ x 8′ to 12′ and 11/16″ to 2″ thick. They cover large areas fast. They're rigid and strong, yet light in weight. Dead load is reduced—and framing can be lighter in construction. Once up, Transitop continues to prove its economies—it is virtually free of the need of any maintenance.

The reason is, Transitop consists of two surfaces of rock-hard, compressed asbestos and cement with an insulating core sandwiched between. It stands up to wind, sun and rain—gives no worries of expansion and contraction.

To see the many ways Transitop can help you in your construction—to see how easily it is erected, to learn of its economies—send for the illustrated brochure on J-M Asbestos Transitop—write Johns-Manville, Box 158, New York 16, N.Y. In Canada, Port Credit, Ontario.

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HOW CHROMALOX ELECTRIC HEAT
helps make it...and make it work

...the U.S. Navy's new Mark 32 fibre-glass torpedo launcher

From its unlikely beginning as a fibre-glass mat . . . to its successful operation in sub-freezing sea spray . . . the Mark 32 torpedo launcher testifies to the versatility and dependability of Chromalox electric heat. Designed and built by Apex Reinforced Plastics, division of White Sewing Machine Corp., this lightweight, corrosion-resistant launcher is now in service on Navy destroyer escorts.

Early in production, a Chromalox-heated hood is used in centrifugal molding of the launcher tubes.

First, a rolled fibre-glass mat is placed inside the mandrel, which is then engaged in spinning motion at 800 rpm. After thermosetting resin has been sprayed into the mandrel, the hood is lowered into position for heat curing. The Chromalox type RAD Far-Infrared Heaters have a total capacity of 36,600 watts, and work reaches approximately 200°F. in about 45 minutes. The hood remains on a total of about 3½ hours, throughout the spinning operation.

Before final assembly, each tube must have steel "nut bars" and "guide bars" cemented to its interior. (Nut bars connect the three tubes into one assembly; guide bars guide torpedoes into the launcher tube.) After these parts are cemented in place, two Chromalox Tubular Heaters wired in series set the cement.

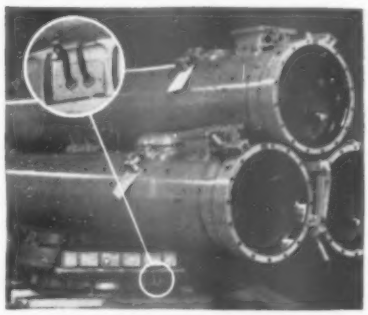
Mounted in a frame which holds them in the center of the tube for its entire length, the 240-volt, 2750-watt heaters are controlled by a Chromalox type AR Thermostat. A small fan attached to the end cap circulates heat within the tube and eliminates condensation.

Next, four plastic quadrants are bolted to the tube interior, forming a liner to accommodate 12¾-inch torpedoes. To each quadrant are affixed two 101-inch Chromalox Flexible Woven Heaters.

After resin has been applied to the two channels in each quadrant, heaters are laid in place as shown below. The leads are then connected

to a power outlet and the heaters set the cement which bonds them in place. In action, these heaters maintain a protective 50°F. minimum temperature for the torpedo.

The closeup below shows two leads of a circular Chromalox Tubular Heater clamped in a groove around the launcher's swivel base. To prevent formation of ice in the joint between fixed and rotating parts of the base, this heater comes on automatically when the temperature drops below 50°F.



Plastic bottles, containing air at 2000 psi, provide pneumatic force to launch the torpedoes. Fabrication of these bottles, by the unique Apex filament winding process, involves still another Chromalox Heat application. After the plastic bottle has been formed around a Cerro-alloy ball mold, the alloy must be melted from the bottle's interior. Four sets of Chromalox Strip Heater Bands and a Chromalox Ring Heater provide booster heat on the steam-heated vat used for this purpose.

Perhaps one of these heaters, or one of the 15,000 other types, sizes and ratings of Chromalox Heaters can answer your need for heat. For personal assistance and specific recommendations, *Call your Chromalox Man for the Answers.* He's listed at the right.

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analysis for process troubleshooting and other problems.

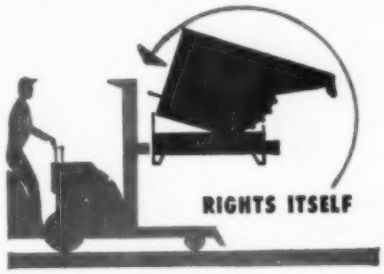
We feel that statistical methods can be invaluable tools to the research and development engineer as well as to QA and reliability people. As a result, we feel that one of the greatest contributions the quality engineer can make to his company and profession is to introduce these tools to other engineers. Experimental designs are superior in every way to the trial-and-error method of determining the effects of variation. In addition, they often provide solutions to complex problems that could be obtained in no other way. Here is a good example of this point:

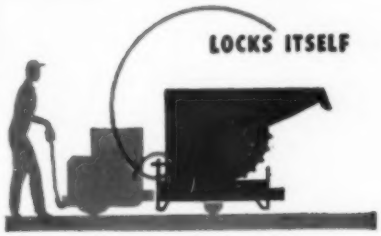
We once found that a large percentage of transistorized radio receivers were subnormal in performance under certain conditions. Problem was to find out whether the cause was due to variation in the receiver circuitry or in the four transistors involved. To do this, we set up a Graeco-Latin Square Experimental Design Arrangement and made 275 measurements with 11 receivers and 55 transistors of each of four types. We analyzed the variance and found that over 50% of the total variation was being contributed by the receiver, 28% by one transistor type, the remainder by the other three transistor types.

If we eliminated all the transistor variation, we would still have over 50% variation left in the receivers and undoubtedly would continue to have trouble. The obvious thing to do was to concentrate on the receiver. This was done—and a simple circuit design change cleared up the trouble.

If we had used the trial-and-error method on this problem, we would have had to make over 1-million measurements. We might still have had inconclusive results, plus a high mortality rate among receivers, test equipment, and engineers.

You don't need to have many experiences like this to convince you of the great value of statistical methods in coping with today's reliability problems. But to do this kind of work, you must have an organization that is qualified to handle it. This means highly qualified professional





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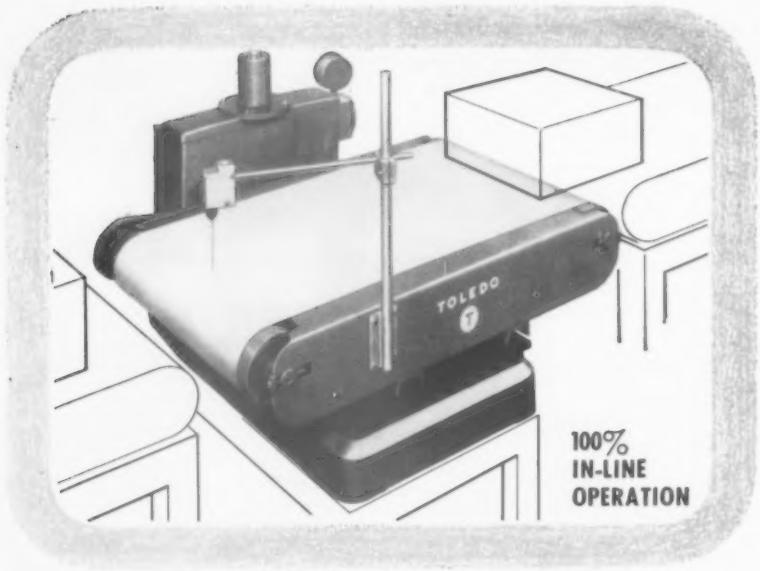

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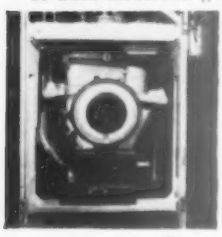

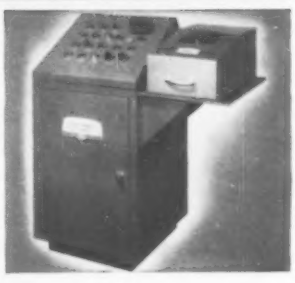

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TODAY'S QUALITY DEMANDS
Begins on page 168

personnel, as well as intensive formal training of all QA employees in basic and advanced statistical methods.

WHERE OR FITS IN

Operations Research (OR) is a fairly new management and industrial tool. It is usually placed on the corporate or division staff level in the organization chart. We have deviated from this practice for good reason. Our goal is to produce reliable products second to none. To do this, we felt that operations research could best serve the interests of the company as a branch of quality assurance.

But this does not mean its services are limited to our activities. It serves the entire company. Its principal functions are applied research projects, problem service, consulting, training, special projects. Its major areas of pure research at present center on reliability theory and economics.

Applied research projects include a production planning system, an inventory management system, a new approach to cost analysis, sales forecasting techniques, and financial planning techniques. Problem service includes many specific questions in the fields of statistics, mathematics, physics, and chemistry. An interesting QA problem now in progress concerns the design and analysis of an experiment to evaluate an etch process in terms of transistor reliability.

The problem service also deals with accounting, quality control, and industrial engineering questions where specialized knowledge of mathematics or the sciences can produce the best results.

The functions of consulting and training generally concern the same areas as problem service, as these areas complement each other.

Finally, in the special projects area, the operations research branch members act as staff consultants to the QA department manager. Projects include reliability and quality control contract proposals, department planning, and department computer programs.

END

The Ludlow Line Protects Your Products Better

Can this product run circles around yours?

Shipping Superintendent Charles D. Fraizer, at Kaiser Aluminum's Newark, Ohio plant (left) meets with Raymond W. O'Brien, spiral wrapping consultant from Ludlow's staff of field engineers.

If you ship products in coils or straight lengths, Ludlow's spiralwrap paper — applied by Ludlow spiral wrapping equipment — will give you attractive, dependable packages in a fraction of the time it takes to wrap them by hand.

The wide variety of Ludlow creped papers available for spiral wrapping includes: regular and waxed creped kraft, asphalt and non-asphaltic (non-staining) laminated; also reinforced paper for heavy-duty packaging; VPI paper for anti-rust packaging; non-asphaltic neutral paper for non-corrosive packaging and now polyethylene, laminated or coated. All of these papers are available in plain or printed form. Printing is done *before* creping for maximum legibility.

Ludlow spiralwrap papers, free engineering service and a complete range of machines are typical of Ludlow's job-tailored packaging products. Look to Ludlow for greater protection, lower costs and faster packaging. We'll consider it a privilege to serve you.

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REPUBLIC "50" HIGH STRENGTH STEEL PALLETS

withstand temperatures over 900° at Anaconda Aluminum Company

Republic "50" High Strength Steel Pallets solved a particularly severe problem at the Anaconda Aluminum Company, Louisville, Kentucky, world's largest independent producer of aluminum foil.

Twelve-hour annealing cycles of aluminum coils at temperatures over 900° F. caused rapid deformation of the ordinary steel pallets previously used. This deformation damaged the edges of the aluminum coils, resulting in a serious reduction of foil yield. And because deformation of the pallets limited the height to which coils could be stacked, a storage problem was created.

The Republic "50" High Strength Steel Pallets have now been in service for over two years with no sign of deformation. Conservative estimates place the life of the new Republic "50's" at ten years—five times that of previous pallets, with no damage to coils, no lost production time, no wasted materials.

The low alloy steel used in producing Republic "50's" has a minimum yield point of 50,000 psi and a minimum tensile strength of 70,000 psi. It is the combination of basic alloy steel and Republic's extensive heat treating experience that gives these pallets the extreme strength needed for the job.

Let the materials handling engineers of Republic's Berger Division work with you in solving your materials handling problems. Call your Republic representative or write direct.

For more facts Circle Reader Service Card numbers as follows:

REPUBLIC WEDGE-LOCK® PARTS STORAGE UNITS are easy to load or unload from either side. And, the heavier the load, the tighter the grip, because patented Wedge-Lock construction includes a post that will not buckle; a concealed sway-proof joint; and a reinforced shelf that does not sag. Unlimited shelf arrangements. World's strongest. Capable of exceptionally high stacking. Republic Storage Engineering specialists will help you plan. For complete details mail coupon.

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Can you spot the union men below?
If you can, you'll begin to see what's...

COMING:

He's cold, logical, able. He thinks like you. He'll change the whole approach to bargaining and labor relations in your plant.

CAN YOU TELL which three of the six men at left are union leaders? Try it. All six were photographed during the course of labor-management arbitrations held at the offices of the American Arbitration Association, New York.

Here's the answer: The union leaders are at left in the top row and at left and right in the middle row. The other three men are management representatives.

Your errors (we assume you have made at least one—if you didn't, you beat FACTORY's editors at their own game) point up a major change that's taking place in the labor movement: Labor leaders today are looking—and acting—more and more like businessmen.

What will the change mean to you? It will mean tougher day-to-day relations, more intensive bargaining sessions for plant operating managers in the days ahead. And this change is taking place right now within your plant walls as well as at the international union level. It's reflected in the kinds of men who are gaining shop-steward positions and union local offices.

The changing look in union leadership will show its face in your plant in three important ways:

• **You'll find well-trained stewards who'll forsake noise and threat for cold, persistent logic.** These men, in their efforts to resolve shop grievances, will not be fooled by foremen's bluster. They'll talk intelligently about employee motivations, setting goals together, and many other of the advanced management techniques.

• **At the bargaining table you'll be up against union representatives**

By ALAN E. ADAMS
McGraw-Hill Washington Bureau

A New Kind of Labor Leader

who think very much like you. Only trouble will be that their objectives will run counter to yours. For example, the new union bargaining agents will examine automation on purely factual grounds, not as an emotional issue. But they'll use mathematics to demand "their share" of its benefits. On the productivity battleground, too, they'll muster arguments just as convincing —and just as confusing—as management's own arguments often are.

• **If your plant is in a small community, it will get more intensive union attention than ever before.** Why? Because the new union leaders are being selected and trained for their ability to penetrate small industrial towns, remote from big city, big union influence.

Your course of action? Don't turn your eyes away from this trend. Be realistic about it. Learn more about the men who are coming to the fore in the labor movement. It will help you anticipate their thinking, cope with their actions.

HOW THE NEW FACE LOOKS

The labor leader of tomorrow is emerging from the manufacturing plants, steel mills, job shops and construction projects. He'll carry a fat briefcase, probably wear a ready-made suit with unobtrusive necktie —perhaps even have a college ring. He won't look exactly like a businessman from Madison Avenue, or from anywhere else. But neither will he be recognizable as a labor leader—of the type we know today.

The labor leader of tomorrow is a brand-new type, the successor to the George Meanys, Walter Reuthers, Jimmy Hoffas, and Dave McDonalds. He's emerging out of necessity. He's the new face for the new kind of labor movement that's coming. When that happens, he is going to be an important—and different—challenge to management. He'll be hard to recognize at first. He bears watching—and preparing for. In some of the big powerful unions he is already in the wings—waiting. In others, he has barely made a dent. But his time is coming.

WHY THE NEW LOOK?

This new look in labor leadership is coming partly because labor unions are in trouble today—and partly because they face some brand-new challenges. These are problems that won't disappear in a day, or even in a year.

Take these examples:

• **Bargaining**—Unions must now begin to negotiate in the general arena far beyond the previous confines of their own bargaining table. This year's steel contract talks are the forerunner for negotiating, not out of an industry's particular financial situation, but out of the general economic picture.

• **Organizing**—Unions have about milked industrial territories dry for members. To expand they must round up your white-collar, professional, and service workers—arid land to current labor organizing devices. They must find new salesmen and a new sales pitch.

• **Politics and legislation**—Union activities in these areas will be greatly extended. The aim: to ward off laws (like the Landrum-Griffin bill) that could curb their activities. And to promote legislation that does what negotiations and organizing fail to do. Failure of labor lobbyists to capitalize on the liberal 86th Congress has brought this lesson home.

• **Racketeering**—Union leaders must erase this bad mark by revamping much of their own internal structure. They must prove responsible in handling their massive financial interests—the growing union treasuries, the multi-million-dollar welfare and pension programs, the giant low-cost housing developments.

These are the complexities union strategists see ahead. To solve them they pick this new type of labor leader—the professional.

WHAT THE NEW PRO BRINGS

"He'll look rather like the businessman of twenty years ago," according to the description of one top AFL-CIO strategist. "He won't have much in him of the successful business leader of today. And he won't be suave, will still come up with an occasional 'ain't.' "

He goes on: "He'll be the self-made man. If he went to college, it'll be because he worked his way through—in the industry where his union operates."

This is a far cry from the picture of today's labor leader—John L. Lewis, who went into the coal mines at age 14 and roared through the big union years, when labor membership advanced from 4-million to 18-million. Or from George Meany, who rose up the union ladder from business agent of a Plumbers' Union local in New York to head of the 140-union AFL-CIO.

Tomorrow's labor leader won't look like United Auto Worker Reuther, labor's tactical strategist who first raised the political war cry against management. Or like broad-shouldered, ham-fisted Jimmy Hoffa, who is at least as tough as the truck drivers he represents.

The new leader faces different problems. He inherits rich, complicated organizations these predecessors built up. He becomes responsible, not only for negotiating better wages and working conditions —but for running organizations that are about as intricate as the corporations they bargain with.

He needs to have specialized training himself, not just to keep expert specialists about him. It won't be enough, in the future, to assign the tough problems to the trained staff members. These problems are going to be too much a part of his job. The responsibilities already developing in the cures for labor racketeering will be put squarely on the head of the union president.

Our new man will have another side. Along with his professional training, he'll aim to be a part of the community he lives in. The rough edges that might have separated him from the businessman will have been chipped off. The shoulders of his suit jacket may not be as narrow. But he'll be able to talk the same language as the industrialist at the town meeting.

Turn the page

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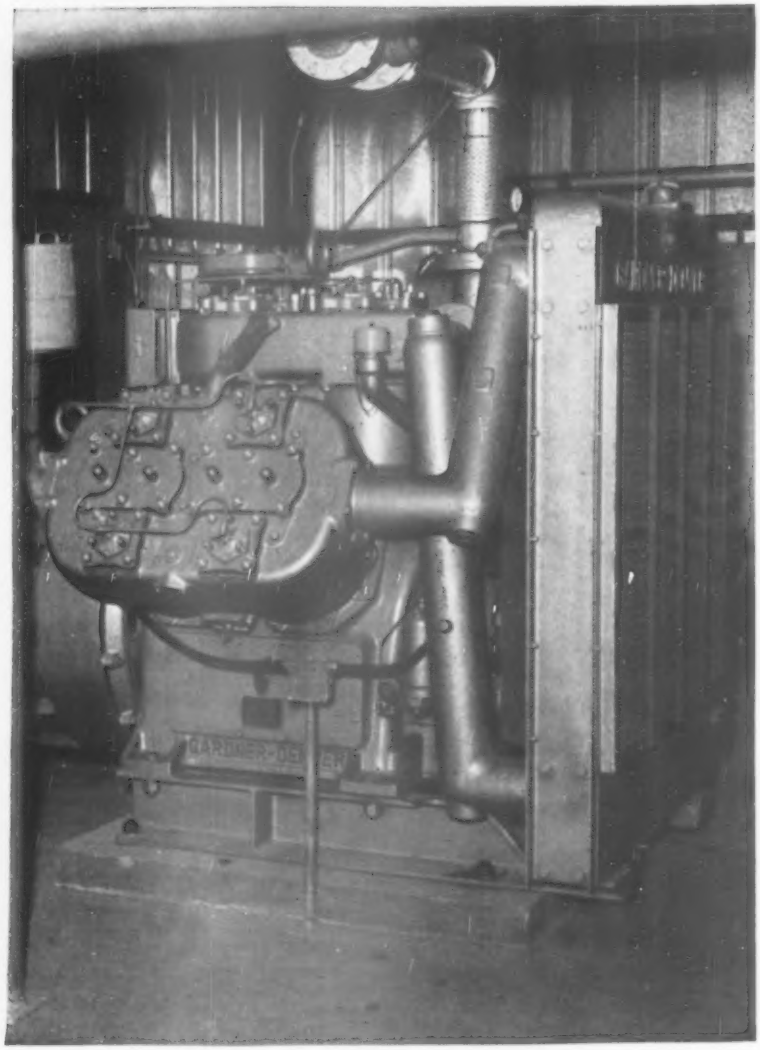

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LABOR'S NEW LOOK

Begins on page 182

Labor unions are already well into this area with extensive community services programs. They take part in blood banks, grant university scholarships, collect for social welfare programs, even sponsor symphony orchestras.

The idea—to have unions accepted by the public. To take off any tarnish the union label may show to the public, the community.

While this program is being promoted among the rank-and-file currently, the new union president will be a big part of the future planning. He's got to sell unions to groups that are traditionally negative to the union approach—to the engineer, the office worker, the bank clerk. He must, the union strategists say, be accepted as a community leader —not only a labor leader.

WHO'S IN THE RUNNING

The change in union leaders isn't coming overnight. But you can already see traces of it. In some of the biggest unions the moves are already aimed in the direction of the professionals.

Take the United Mine Workers. Lewis, an octogenarian, is showing no signs of wanting to retire, nor has he slowed much from his heavy daily routine. But when the time comes, the powerful union leader will tap his successor.

The Lewis forefinger is likely to point at a man up from the mines, head of a UMW local in Billings, Mont., who has been serving as Lewis's assistant in Washington for more than 10 years. Next to Lewis, he is considered to be the expert on mineworker wages. This man, W. A. ("Tony") Boyle, has been tapped twice already by Lewis to handle the union's complicated wage cases with the government involving the Walsh-Healey Act. Tight-lipped, almost taciturn, Boyle consciously avoids the public spotlight—in this respect is the antithesis of the dramatic mine union president.

There's another similar change in the offing. David Dubinsky, flamboyant president of the International Ladies' Garment Workers Union, has already selected his successor—for when the time comes. At the

union's recent convention he voluntarily gave up his second post as secretary-treasurer. Picked as his replacement Louis Stolberg, long an expert in the complicated labor-management contracts in the garment industry. Stolberg, the professional, is quiet and softspoken —a direct contrast to the bombastic, emotional Dubinsky.

In the International Brotherhood of Teamsters there are no prospects of imminent change. Despite the embattled Hoffa's troubles with Congress and elsewhere, he seems likely to stay at the helm of the 1.5-million-member trucking union. But if a change should come about, it fits the theme.

Next in line to Hoffa is a former St. Louis Teamster official and now his No. 1 assistant in the Teamster headquarters—Harold J. Gibbons. Gibbons's own Teamster local in St. Louis has developed an extensive welfare program, a summer camp, and other benefits for the members. He's now a planner for the national union. Hoffa says of Gibbons: "He's my egghead."

As the line of veteran labor leaders beings to break up, the shift to the new style union president may be gradual, or it may not show up at all in the first change. In some unions, particularly the AFL-CIO craft unions, the lines of succession are already set. The union vice presidents have been waiting for some time.

When it comes to running the AFL-CIO—the country's top union post—no immediate change is anticipated right now. Meany, who will soon be 65, says he has no intention of retiring. But if this did happen, his successor would come from the 29-member AFL-CIO executive council, which is made up mostly of veteran union presidents.

Walter Reuther, of all the council members, most nearly fits the picture of the future president. But one union staff member notes, "Even he doesn't make it." Reuther, now past 50, is still the image of the labor-management sociological conflict—and this is not a theme that the future labor official will be promoting actively.

Turn the page

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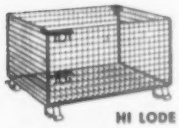

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LABOR'S NEW LOOK
Begins on page 182

WHO THE COMERS ARE

On the other hand, Reuther's big United Auto Workers provides a good illustration of the labor leaders of the future. If the red-headed labor leader steps down, there's a likely contest between the new- and old-style labor leaders.

The candidates are expected to be the UAW's secretary-treasurer, Emil Mazey, an old-line Socialist who outdoes Reuther when discussing management's faults; and his probable challenger, the more temperate Norman Matthews, who heads UAW's Chrysler Division, plus half-a-dozen other key UAW departments.

Beyond these current candidates, there are Reuther braintrusters moving in line for the president's job in the future. Several young men, none yet 40, have already taken steps up the ladder. And what has happened confirms a stipulation that the future labor leader should come out of the industry his union bargains with.

Two top advisers to Reuther are Jack Conway and Doug Frazer, both highly trained idea-men for the UAW president. Both were hired as professionals, though they came out of the UAW ranks. But these two men knew that to move up the union hierarchy they must first move into elected positions—be voted in by the rank-and-file, not hand-picked by the leaders.

Conway moved first with a plan to run on a local UAW ticket. But he withdrew from the test because of what one observer described as an "anti-intellectual bloc" within the UAW. Then came Frazer's turn. When the resistance didn't develop, he went on the ballot and was elected as a regional director.

In the International Association of Machinists, there's a "comer" way down the ladder. But already he's being talked of as officer material at the 900,000-member union. Vernon Jiricowic, 35, an assistant research director of the IAM, recently quit his job to run for office. He was elected as a grand lodge representative, and that put him on the bottom step of the Machinist's political totem pole.

Turn to page 188

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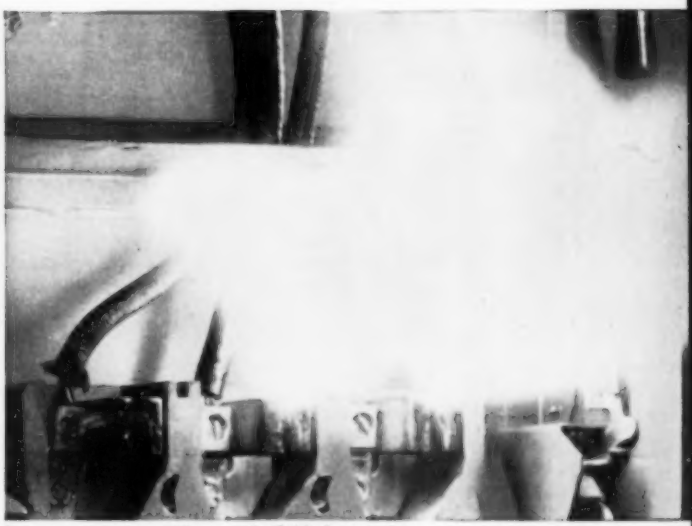

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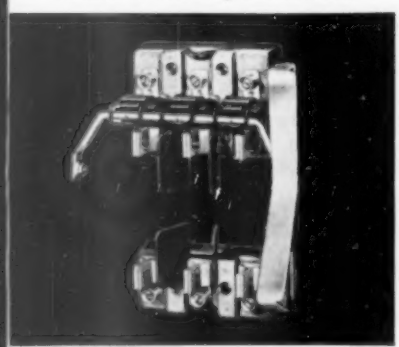

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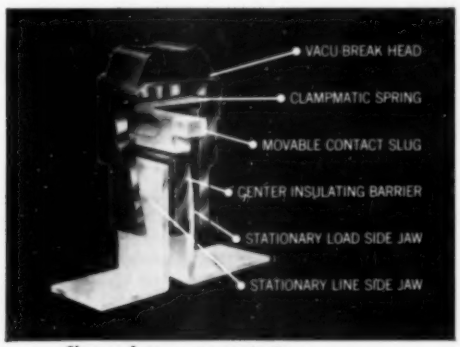

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LABOR'S NEW LOOK

Begins on page 182

These young labor officials are a far cry from the top. But the fact they are being elected to union office is a clear indication of acceptance of the professionals by the rank and file. They are what tomorrow's leaders will be like.

WHAT THE NEW MEN FACE

It will be no picnic for the future union president. With all his expertness, he's got to break brand-new ground—and fill up some of the old holes as well.

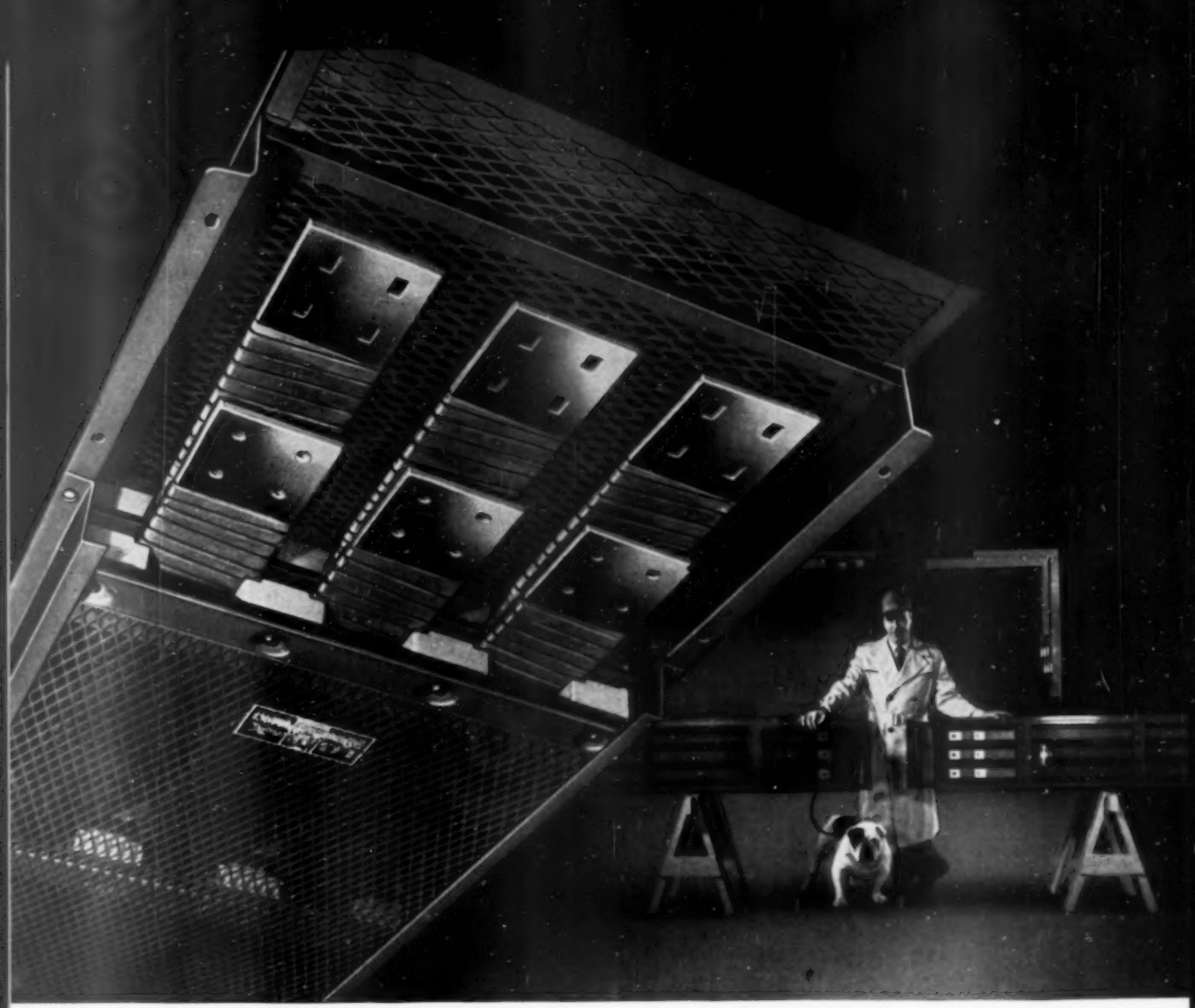
To start with, he'll need extensive financial training, because he will have responsibility for handling his union's funds. He'll not only be held responsible for mishandling funds, but also for bad judgment in investments. His fiscal moves will be open to public view and, if he's to erase the onus of labor racketeering, he'll have to demonstrate his technical know-how.

For this he'll need an economic training beyond the specifics of his particular industry. When he bargains, he'll be required to show how his demands fit the total economic picture. He'll be held accountable for the pressures he may put on this economy. His explanations on productivity vs. inflation will have moved into the public domain.

Another important facet of the new leader's training will be a community role—the part he plays as just plain citizen. There will be considerable emphasis here. How he looks to his neighbors and community could have a significant effect on their attitude to unions. And it's the small communities the unions are aiming to penetrate.

In all their organizing efforts, the labor unions have failed not only to crack the small towns but the big white-collar and professional territories as well. There has been an inherent resistance, in part due to the public image of the union official as someone who is not up to the social scale of the white-collar worker. Reuther says that the public seems to think "unions are for people in dirty shirts who get their hands dirty."

There will be a determined campaign to erase this image. The new



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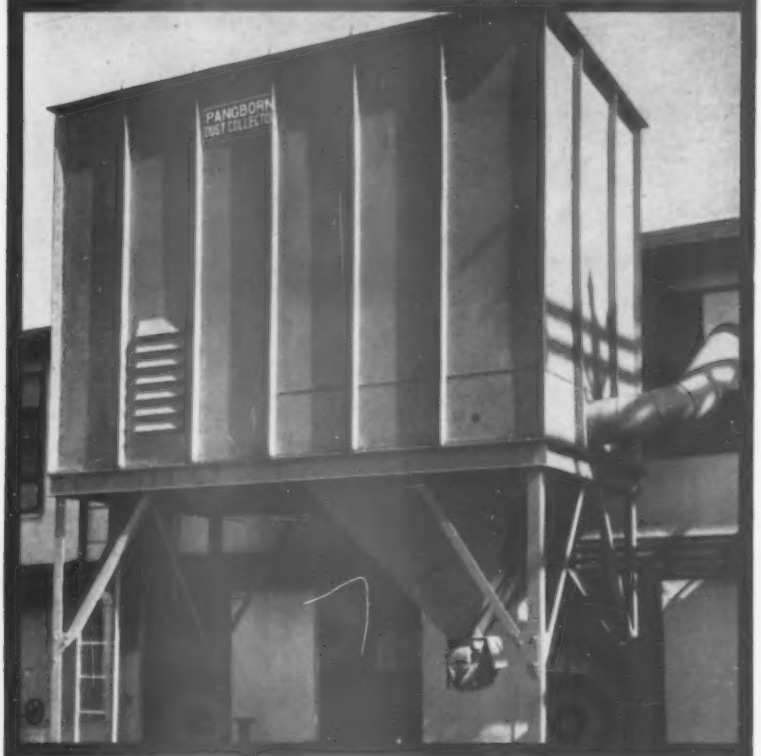

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Pangborn CONTROLS DUST

LABOR'S NEW LOOK
Begins on page 182

labor leader's professional training for the job will help change this picture. The concentrated efforts to be an active part of the community will enhance it.

Even now, labor unions are spending extensive energy and funds on projects of no direct benefit to them except in altering public opinion. Dozens of unions have scholarship funds for students. They provide educational grants for scientists, researchers, historians. They award prizes to political, social, medical, and other leaders for their contributions that have had nothing to do with labor unions directly. For example, a recent $1000 award to Jonas Salk for development of the polio vaccine.

One indication of the extent of the union community service programs: their past United Fund and Community Chest collections. The AFL-CIO service division provided 138 full-time labor representatives for the staffs of local funds and chests to help collect in the regional drives this year.

The labor unions also have organized extensive training for their members. Many unions set up their own education programs with staff experts as teachers. Others send their members to universities for concentrated study periods.

The curriculum is not limited to the economics of labor and management. In New York, for instance, the head of the International Brotherhood of Electrical Workers, Harry Van Arsdale—an old-line trade union leader—has set up a training program for his union business agents. Every week they attend a tutoring session, handled by a Columbia University professor, on the subject of foreign affairs.

This emphasis on broad training for union leaders and members today is the opening move toward the labor professional of the future. Up to now, the professional has almost always been restricted to the hired staff (only Ralph Helstein, president of the Packinghouse Workers —a lawyer—breaks the pattern). This kind of professional today is becoming the elected official who will, in time, run the union.

END

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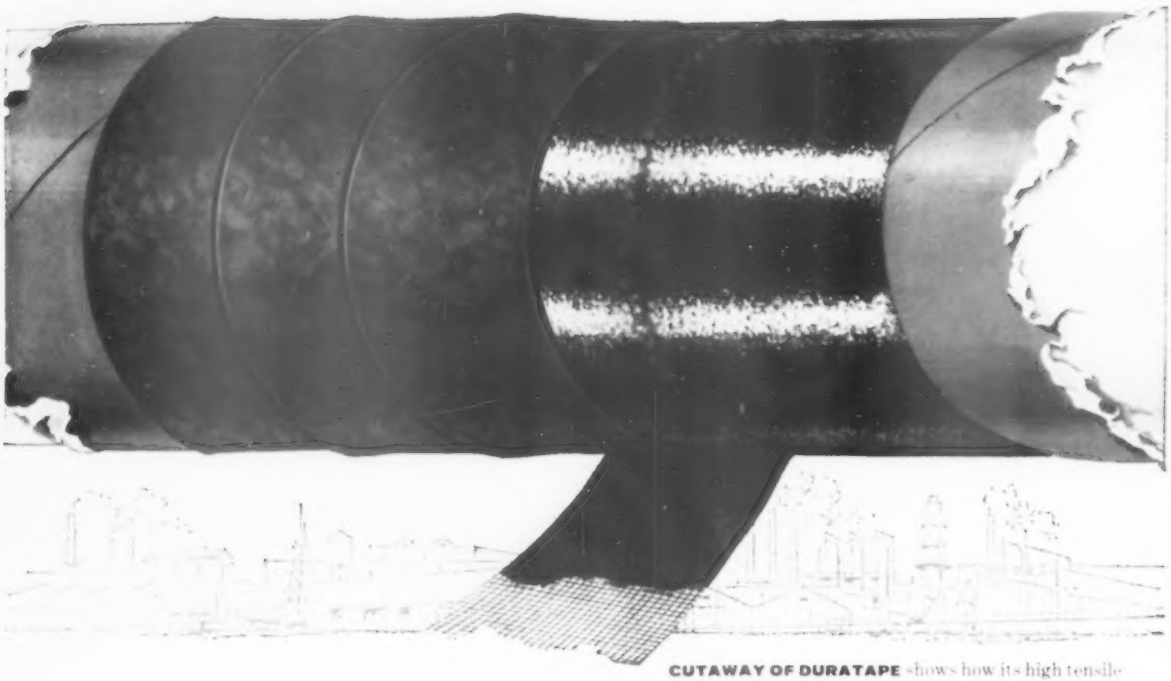

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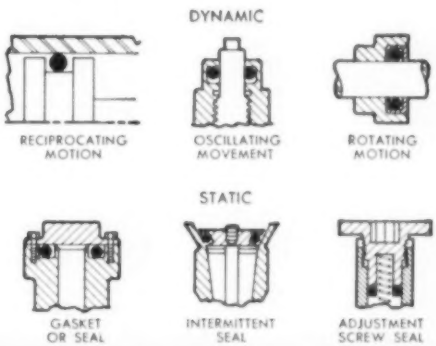

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FACTORY

LABOR RELATIONS NEWS

By PAUL A. KING, Attorney, Bigelow-Sanford Carpet Company, Inc.; Member, New York Bar

Contracting Work Out Is Okay, Say Courts

Failing to get prohibiting contract language, this union filed a grievance on contracting out. Not discrimination, not a lockout, ruled the judge.

In New Orleans, a federal court gave contract maintenance a big boost by endorsing contracting out of work that could well be handled by union members. In fact, it had been in the past. Although the company won out, it had been dealt a good hand—one which you may not be lucky enough to find in your palm.

Warrior and Gulf Navigation Company moves steel products and raw materials by barge. Runs its own terminal where it repairs and maintains its barges. From time to time it has contracted out some of its repair and maintenance work. But this was always a touchy subject with the union. During negotiations of prior union contracts, the union tried to write in a clause limiting the company's right to contract out work.

The union didn't get anywhere at the bargaining table, so it tried to succeed at arbitration. Again, the union was set back.

The union started things off by filing this ominous sounding grievance:

"We are hereby protesting the company's actions of arbitrarily and unreasonably contracting out work to other concerns. The work could—and previously has been—performed by company employees. This practice is unreasonable, unjust and discriminatory because, at present, there are a number of employees that have been laid off for 1½ years or more, allegedly for lack of work. Confronted with these facts we charge that the company is in violation of the contract by inducing a partial lockout of a number of employees who would be working, were it not for the unfair practice."

The company refused to entertain the grievance; refused to go to arbitration. It cold-shouldered the whole thing and left the union no choice but to go to federal court to get an order compelling arbitration. The union lost in a federal district court and again lost on appeal to a federal circuit court. The circuit court minced no words as it knocked down the union's contentions. Here's how the court ruled:

- Before a court can order arbitration, the union must show that the collective bargaining agreement requires the company to arbitrate.
- Here, there was a clause in the agreement stating that "matters which are strictly a function of management shall not be subject to arbitration."
- The agreement does not "deal with the power of the employer to contract with others to perform services previously done by its employees."
- This subject is strictly a matter of management. The company's case was bolstered by the union's unsuccessful demand for a limiting clause at prior negotiating sessions. The union had failed at the conference table to obtain the consent of the other party to the inclusion of a clause limiting the company's right to contract out work. It would, therefore, be unconscionable for a court to give the union what it had been unable to secure at the bargaining table.

What about the high-and-mighty-sounding arguments raised by the union? The court had little patience with them. Again it blasted the union argument in no uncertain terms. Here's what the judge said:

"The appellant (the union) attempts to characterize the simple facts of contracting out maintenance work as 'unreasonable, unjust, and discriminatory.' It asserts that such conduct by the company amounts to 'inducing a partial lockout.' This is an attempt to set the complaint within the frame of reference of the agreement to arbitrate. These words cannot change the fact that the criticized action (by whatever name called) remains exempted from the range of arbitration. Moreover, it is plain that characterizing this action as 'discriminatory' is not sufficient to bring it within the prohibition of the contract which forbids 'discrimination against any member of the union.'

"This is so because there is no discrimination charged in the grievance except that the contracting out occurred at a time when there 'are a number of employees that have been laid off for 1½ years or more, allegedly because of lack of work.' Nor does the characterization of the company's action as 'a partial lockout' bring it within the language of the section making a 'lockout on the part of the company' a violation of the agreement. Any contention that such action as is here criticized amounts to what is known in labor-management relations as a 'lockout' is clearly a simple play on words and is insubstantial."

Another Case in Point

This arbitrator endorsed the practice of farming out work even at a time when other workers were being laid off.

No need to list the advantages of a union contract that permits contracting out work without special union permission. The employer who has one is indeed lucky. This employer had one, but it happened to be hedged with ifs, ands, and buts. However, an arbitrator resolved all the ambiguities in the company's favor. In your case, it might be otherwise. Much depends on the facts.

Turn the page

Let's not clean away dollars and man-hours with costly, inadequate floor care

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Wherever *combination-machine-scrubbing* is the practical solution to the floor-cleaning problem, any lesser, slower method is wasteful of money and manpower. A *Combination Scrubber-Vac* applies the cleanser, scrubs, flushes if required, and picks up (damp-dries the floor)—*all in one operation!* Maintenance men like the convenience of working with this single unit . . . the thoroughness with which it cleans . . . and the features that make the machine simple to operate. It's *self-propelled*, and has a *positive* clutch. There are no switches to set for *fast* or *slow* — slight pressure of the hand on clutch lever adjusts speed to desired rate. The powerful vac performs quietly. Cable reel is self-winding. *Finnell's 213P Scrubber-Vac* at left, an *electric* unit for heavy duty scrubbing of large-area floors, has a 26-inch brush spread. Cleans up to 8,750 sq. ft. per hour (and more in some cases), depending upon condition of the floors, congestion, et cetera. (The machine can be leased or purchased.)

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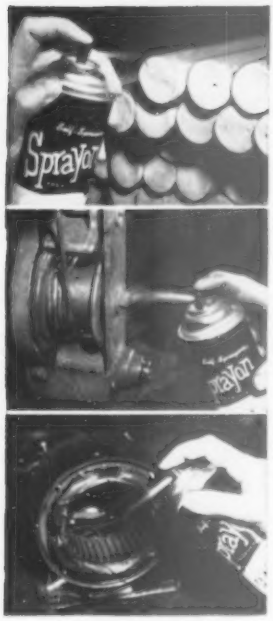

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The contract allowed farming out of unskilled work, but forbade subcontracting that would make it necessary to lay off or put on part time any regular employee. When orders fell off, the company laid off workers but continued to farm out work the laid-off could have performed. The union kicked. The company just couldn't see why, under its contract, it couldn't contract out work that the laid-off employees had never done. Subcontracting was forbidden, it argued, only when the subcontracting itself would result in layoff.

The arbitrator agreed. Only that subcontracting was outlawed that "made it necessary to lay off workers," he ruled.

In favor of this company was its established practice of contracting out a certain percentage of its work. The arbitrator endorsed the practice so long as the proportion of work performed by the employees in the bargaining unit wasn't decreased. This held even during a layoff, so long as the proportion remained the same as that in effect when the layoff started.

No More Pensions Here

Once you set up a qualified pension or profit-sharing plan, termination may not be a bed of roses. There are important tax problems, this employer learned.

Pension plans look like a sound investment in good employee relations. Supposed to reduce employee turnover, make employees happy, and so on. Once in a blue moon it just doesn't work out that way. The employer puts in a qualified pension plan, sits back and waits for the applause of his employees. And nothing happens.

Nothing happened to the owners of the Kane Chevrolet Company. At least nothing good. Within nine months of pension-plan adoption, a flock of employees resigned. Reduced turnover didn't set in. Those who remained said they'd rather have increased pay. Pensions were not their dish. So Kane cut out the pension plan.

This wouldn't have been too serious, but there was the tax law. Tax regulations state that if a qualified pension plan (or profit-sharing plan) is abandoned for any reason other than "business necessity" within a few years after it has taken effect, it will be evidence that the plan from the start was not *bona fide*. If this were so, Kane would lose the favorable tax deductions it had taken—deductions available to qualified pension plans.

The Tax Commissioner, not having run a business, ruled that termination here wasn't "business necessity" in Kane's case. Kane appealed to the Tax Court. It took a more businesslike view of it: There's "little doubt that dissatisfaction with the plan existed among the very employees for whose benefit and goodwill the program was undertaken. Lack of achievement of its objectives seems to us an entirely reasonable demonstration of the existence of a valid reason for the termination."

For Kane, so far so good. That is, the Commissioner can still appeal the decision. But, regardless of what he finally does in Kane's case, he may not go

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39 T-9

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The salesman spent a week in Bermuda on his commission. The front office rejoiced. But the company lost money.

What was wrong? Factory overhead.

This company has a plant-wide burden rate. All costs are based on it. In some departments, actual overhead is *less* than the standard rate. Profits are high. In others—notably those which turned out these assemblies—actual overhead *exceeds* the standard rate. Prices don't cover it. Profits are seldom—if ever.

How different with Automatic Keysort Data Processing! With Automatic Keysort, the Plant Manager can pinpoint burden charges by *department* . . . and prices may be set to allow for profit in each operation. Because plant operating figures are reported *on time*, unrealistic overhead rates can be quickly spotted.

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NEW CONCEPTS IN PRACTICAL OFFICE AUTOMATION

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along with your case. It could set up a lot of blocks. The net of it may be that you, too, may have to resort to litigation as Kane did.

Vacations for Craftsmen

Maintenance men are mighty important to the efficient functioning of a plant. They know it. But can they throw their weight around when it comes to setting vacations? Here the answer was "No." They had to take what they could get.

The maintenance and repair men of Merck and Company were in a tizzy when this was pinned on the bulletin boards:

VACATIONS

The weeks beginning July 13 and 20 have been selected as the shutdown period for most of the plant this year. The Mechanical Department will be scheduled for work during this period in order to accomplish necessary maintenance and repair work which cannot be done while the production areas are in operation. It is contemplated that half of this department will take vacation during the two weeks preceding the general shutdown and half during the two weeks following the shutdown. This arrangement is necessary because a high percentage of our employees are entitled to three weeks' vacation during 1959.

Within two weeks a grievance was filed. Shortly after, the case was brought before an arbitrator. The question before him: Was company vacation policy counter to the contract vacation clause? The clause read:

"Vacations shall, insofar as practicable, be granted at the time most desired by employees, but the final right to allot vacation periods and to change such allotments is exclusively reserved to the company in order to insure the orderly operation of the plant."

The union charged that the company did not schedule the vacations in the interest of orderly plant operation. The company just wanted to deprive employees of a vacation at the time most desired.

Management explained that the maintenance boys had to work during the two-week shutdown. Thus it was important to plant operations that these workers get their third week of vacation out of the way. Of 118 workers, 100 were entitled to a third week. In the previous year only 36 such employees were so entitled. Two of the three vacation weeks would be got rid of before and after the shutdown. Immediately before and after a shutdown there was less need for maintenance work. The third week would be used up at some other time.

All this made sense to the arbitrator. It was, said he, a matter of the orderly functioning of the plant. Upheld the vacation scheduling.

Rules for Anti-Union Talk

There are things you can say and things you can't say when you talk against joining a union. Best guides

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PHILCO QUALITY FIRST!

Begins on page 194

are the decisions handed down by the NLRB. The latest permits a surprising amount of latitude.

Big puzzle for non-union shop executives with a union knocking at the door is this: What can you say against unionism and still not be brought up before the National Labor Relations Board on an unfair labor practice charge? What, for example, is forbidden? Answer: Threats of reprisal or force are forbidden.

But what is allowed? In a recent case, an employer was allowed to tell his workers that, come the union, the only benefits they'll get are those specifically negotiated with the union. Present benefits, wages, and so on, are thrown out the window. Negotiating starts from scratch.

This is okay. But threats of discharge, shutdown, or plant removal are taboo. Also taboo are threats to cut overtime, curtail loans, limit promotions, drop bonuses and holidays.

Your labor relations welfare depends a lot on your supervisors and foremen. They are your spokesmen. What they say to workers can help you or hang you. Then how do you educate them to say just the right thing?

Employers who have had a go at writing a simple booklet explaining union organization and the rules of the game know that such a booket isn't in the cards. But thick pamphlets won't be read. Also short ones are worse than none. Employers in this box might take a look at "What the Businessman Should Know About the Taft-Hartley Act" put out by Public Affairs Press, 419 New Jersey Ave., S. E., Washington 3, D. C. Cost: $1. The 33-page booklet sets up a hypothetical case. Follows it from the time the union starts to organize up to and through contract signing.

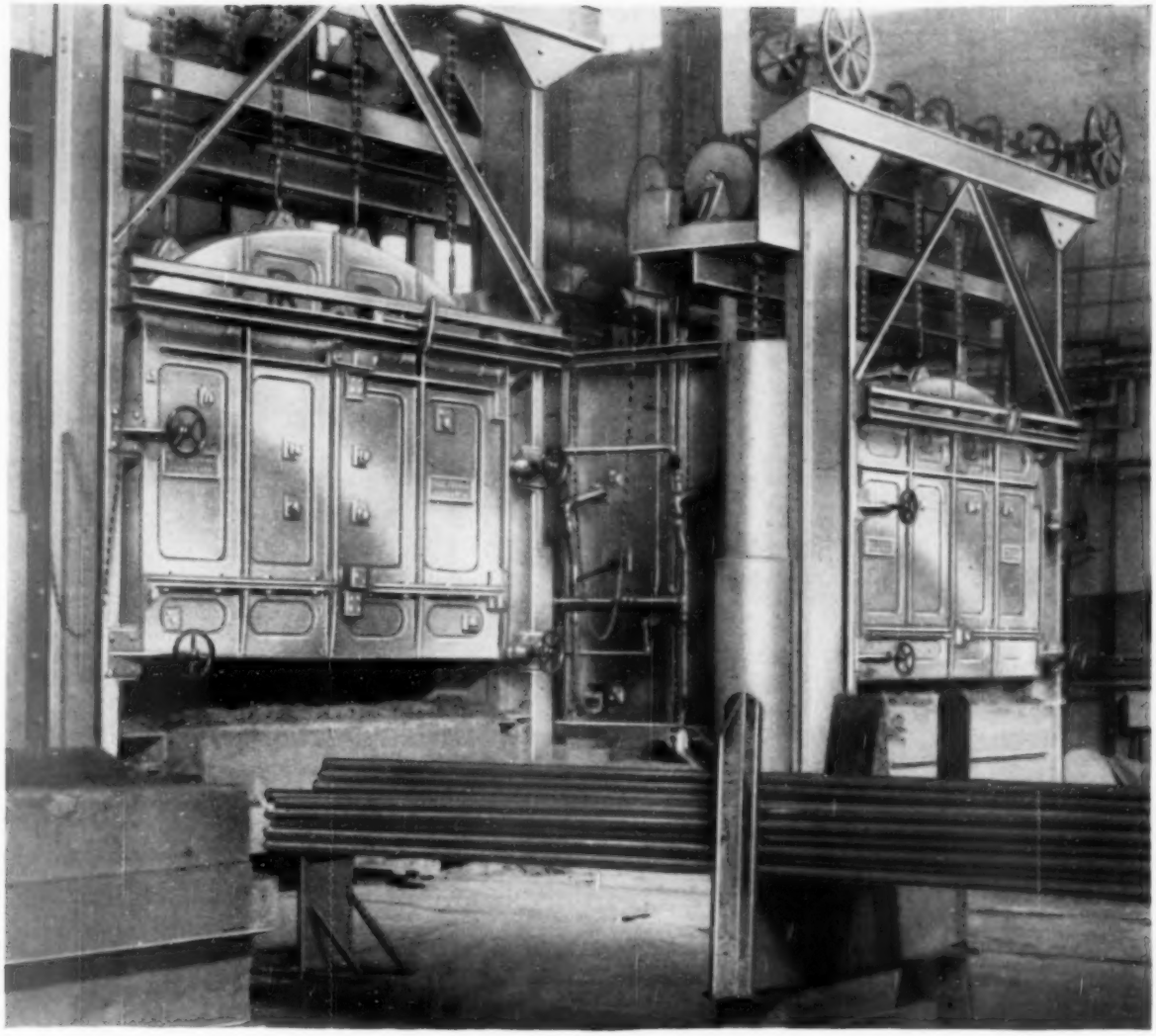
No Bargaining on Grievances

Grievances arising under expired contracts must be arbitrated. You can't throw them into the negotiations for the new contract.

Contract negotiating is no parlor game. It's a rough-and-tumble affair in which the union attempts to put as much heat on the employer as it can. To the fire it built under the company, the Chemical Workers Union added a demand to bargain on the grievances of several workers arising under the contract that had just expired. Relying on the previously favorable attitude of the National Labor Relations Board, it insisted on this demand. The company resisted and took it before the Board. Accused the union of unlawfully refusing to bargain. To the union's surprise, the Board reversed itself, clobbered the union. The Board reasoned:

1. "Expiration of a collective bargaining agreement does not relieve a party to the contract of its contractual obligation to arbitrate grievances which arose during the term of such agreement." This was a ruling of the Supreme Court in another recent case.

2. This being so, such grievances are not in the area of collective bargaining. Belong in the arbitrator's domain.



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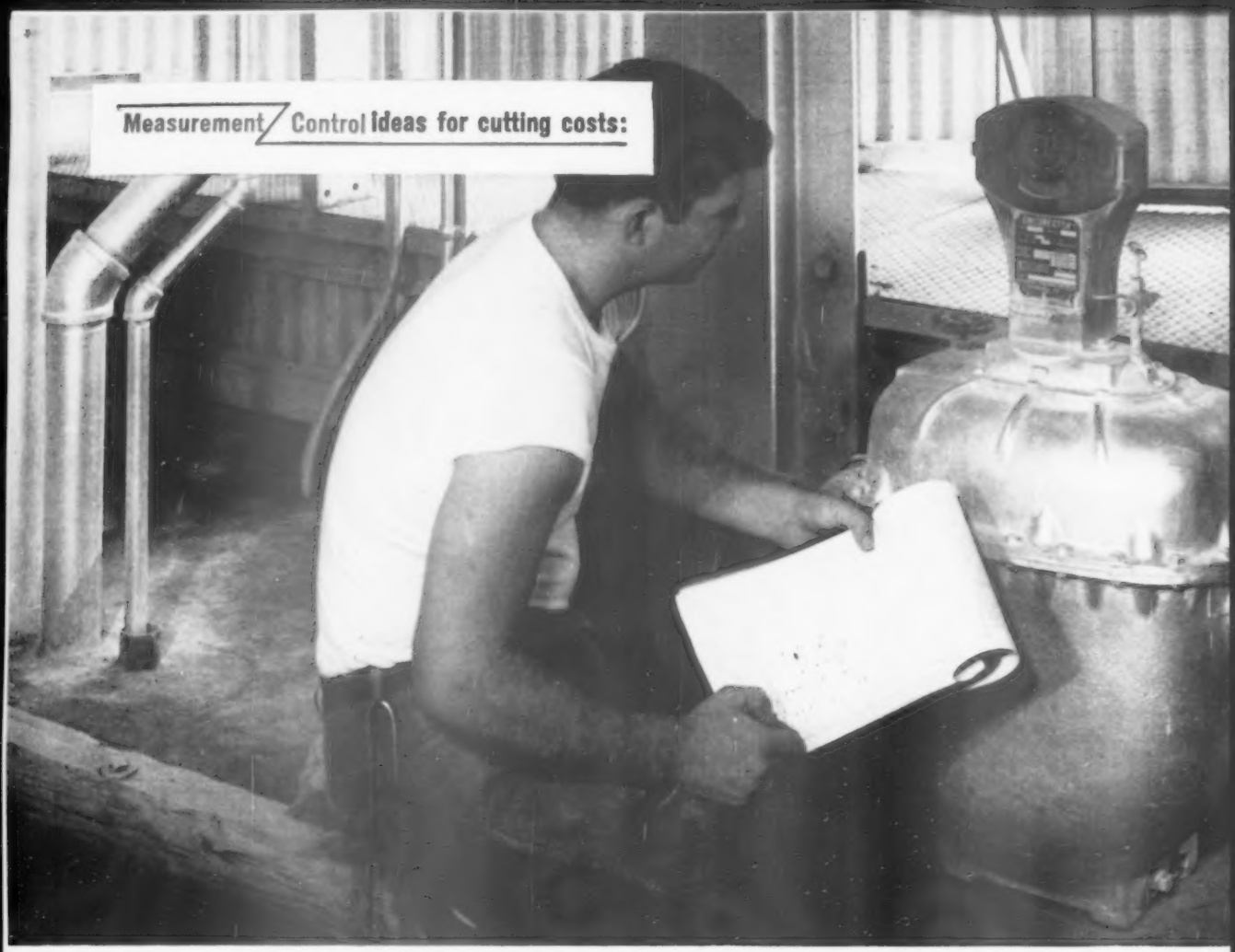

Couldn't "in-plant metering" HELP YOU CUT COSTS TOO?

Wherever things flow through pipe in your plant—whether as fuel, aids to production, or finished products—chances are that in-plant metering will be an immediately profitable investment. For example: above, you see Rockwell gas meters installed on individual enameling furnaces. The meters were recommended by a Rockwell field engineer as a fast, easy way of spotting furnace inefficiencies and preventing fuel wastage. Also, accurate fuel cost records of each operation were available for the first time—Cost Accounting Department figures were made more revealing.

In a bottling plant, another Rockwell field engineer recommended water meters to prove amounts of water actually bottled with product. The result: a sizable reduction in a sewage tax based on the premise that all water going into the plant would be discharged into the sewage system.

These are just a few examples of the many ways Rockwell field engineers are helping save time, money and material in a wide variety of manufacturing and process plants. These field men represent Rockwell's experience as the world's largest manufacturer of measurement and control products. Why not have a Rockwell field engineer visit your plant to explore new approaches to cost cutting through improved measurement and control? Send the coupon—there is no obligation.

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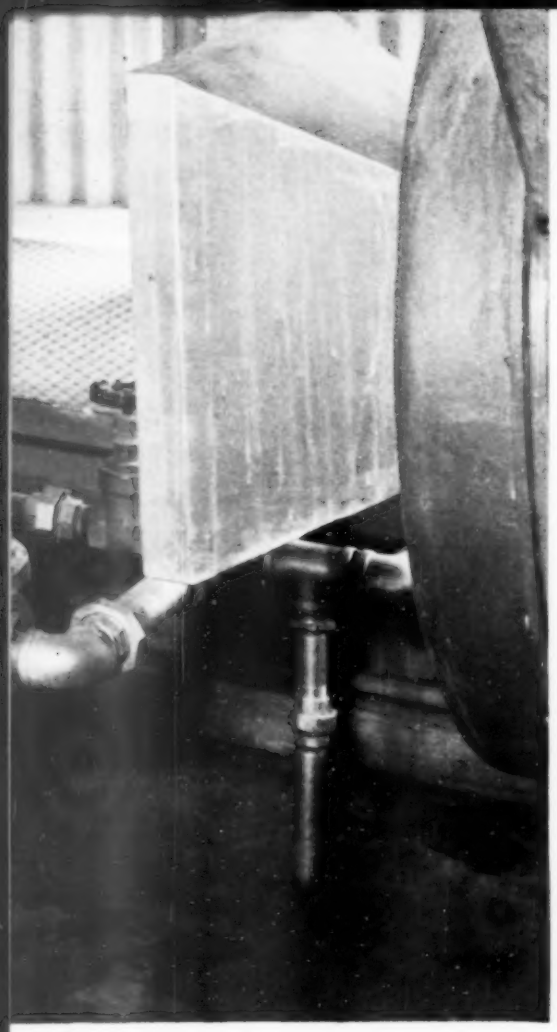

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LIQUIDS AND GASES

"IN-PLANT" METERING can mean new cost cutting opportunities. Accurate liquid and gas meters are a positive way of improving cost control, insuring better use of materials, sharpening inventory control, and preventing waste. Whatever the need, Rockwell has the right liquid or gas meter to do the job better and at lower cost.

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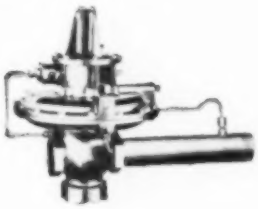

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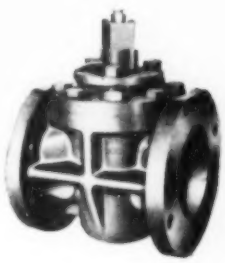

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17 Do's and Don'ts for Bonus Plans

If you keep these suggestions in mind when you're setting up an incentive plan, you will have a better plan—and a lot fewer headaches:

1. The plan should be so designed that the company as well as the supervisor will benefit materially.
2. The factors used in the plan and its operation must appear fair and reasonable to both top management and those covered by the plan.
3. The plan should be designed in such a way that a supervisor, without making unreasonable effort, can increase his earnings enough so that the effort will seem worthwhile.
4. The plan should be so designed that potential bonus earnings of supervisors will always be controlled and cannot run away to unreasonable heights.
5. The participants in the plan should receive at least their regular salaries. No attempt should be made to penalize or fine supervisors because of a poor showing under the plan.
6. Base salaries should be adequate and in proper relation to one another. Base salary values can best be determined by position evaluation. Do not attempt to offset out-of-line or low salaries by installing a supervisory bonus plan.
7. The plan should be simple enough for participants to understand.
8. Those eligible to participate should have a thorough understanding of the intent and mechanics of the plan before it goes into effect.
9. The plan should apply to staff as well as line departments.
10. The plan should usually be applied on an individual basis. That is, the bonus of each supervisor should be calculated separately and should depend upon his own efforts instead of mere luck or what other participants in the plan may do.
11. The factors used in the plan should all be controllable either in whole or in large part by those covered by the plan.
12. The great majority of the factors used in the plan should be subject to objective measurement.
13. The clerical cost of administering the plan should be reasonable.
14. Bonus points should be calculated monthly and the supervisors informed in writing as to their showing for the year to date.
15. Bonus should be paid annually in a separate check and at a time other than the employee's regular pay day.
16. Bonus payment should be accompanied by a report showing how the bonus was computed.
17. For best over-all effect, the supervisory incentive bonus plan should be guaranteed for a year ahead.

With these do's and don'ts and with this sample plan you have a good start toward boosting your foremen's efficiency. Here is a leading consultant's advice on . . .

Setting Up

YOU CAN ARGUE, in theory, that you don't need financial incentives to motivate supervisors to become better managers. But in practice you can harness the power of money to yield dramatic improvements in supervisory performance. These improvements include two key areas: better morale and lower departmental operating costs.

The formula for harnessing the power of money this way is simple:

- **A set of sound policies and procedures.** (See column at left.)
- **A tailor-made incentive plan.** (The simplified plan at the top of the facing page is an example.)
- **Good follow-up.**

Actually, the know-how isn't too complex. Your starting point should be recognition that a sound supervisory incentive plan must be based on the realities of supervisory jobs. This usually means you won't have much success with the kind of incentives normally used for higher man-

By RICHARD C. SMYTH
Smyth & Murphy Associates, Inc.
New York City

Simplified 5-Factor Foremen's Bonus Plan

FACTOR	HOW TO MEASURE THE FACTOR	HOW TO FIGURE BONUS
1. **Productive Efficiency**	Non-bonus hours plus standard hours, divided by actual hours worked. (Standard is 100%.)	Plus ⅓ point for each 1% above 100. Minus ⅓ point for each 1% below 100. Maximum, 10 points.
2. **Adherence to Schedule**	Ratio of value produced to value scheduled. Value delayed by lack of materials or orders not counted against supervisor.	Plus 7 points if percent of adherence is no more than 5% above or below 100%. Minus 7 points if over 10% above or below 100%.
3. **Quality of Product**	Number of pieces of scrap produced divided by total number of pieces produced. Standards vary by departments.	Plus ⅔ point for each ½% under standard. Minus ⅔ point for each ½% over the standard. Maximum, 8 points.
4. **Employee Absenteeism**	Percent is number of man-days lost by absences divided by total scheduled man-days of the department. Standard is percentage of absenteeism for whole plant.	Plus 3 points for absenteeism rate more than 1% below company average. Minus 3 points for absenteeism rate more than 1% above company average.
5. **Safety on the Job**	Lost-time accident rate for department compared to lost-time accident rate for whole plant.	Plus 5 points if department rate is 10% less than plant rate. Minus 5 points if department rate is 10% more than plant rate.

A PLAN like this, adapted to fit your plant's needs, can significantly improve foremen's performance because incentive is directly related to factors that foremen can control. The plan has built-in protection against "runaway" payments.

a Supervisory Incentive Plan

agement, for whom the incentive base tends to be too broad. The individual supervisor soon realizes that his efforts will have only slight effect on the size of the over-all bonus fund and that many others are standing in line ahead of him to receive awards. (In fact, in such situations astute supervisors often devote most of their effort to improving personal relationships with superiors instead of improving their work.)

This is a prime reason why most of the successful incentive bonus plans are savings-sharing plans. These are aimed directly at the most significant aspects of the supervisor's job at the department level. In a typical plan a formula, fixed in advance, sets the amount of bonus according to the relation between each supervisor's actual performance and a predetermined standard of performance.

Take the simplified plan at the top of this page. You'll note the factor of productive efficiency is weighted at 30% of the whole, absenteeism at 10%, etc. The value of the bonus points is related directly to the supervisor's base salary. Thus one point equals 1% of salary. Note also that under this particular formula the maximum bonus that any individual could receive would amount to 33% of his salary. There is, of course, nothing sacred about these numbers. They can and should be varied to meet conditions of your own plant and supervisory improvement objectives.

SELECTING THE FACTORS

Some plans use only a single factor. This can be dangerous. You should avoid it. For example, a plan might pay a bonus only for reduction in departmental direct labor costs.

Probable result: supervisors covered by such a plan will pay little attention to schedules, equipment repair and maintenance, quality, or other key factors.

To avoid this kind of trouble, you should use several factors. These should be selected on the basis of an understanding of the company's own specific situation.

Each factor should meet three basic criteria:

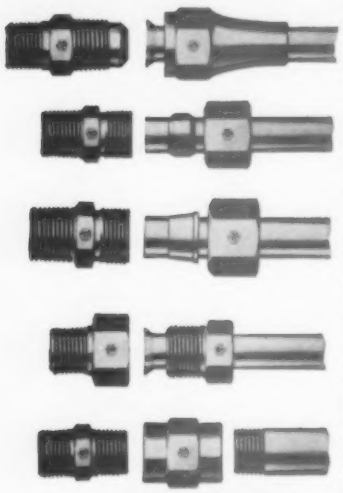
- Better performance by the supervisor should help the company meet its over-all profit objectives.
- A supervisor should have enough control over the factor to be able to do something about it.
- The factor should be measurable, wholly or in large part, on an objective basis.

At the top of this page you will see five of the key factors that might be considered in designing a good plan. In addition to these, you may well find others that would be appropriate. One might be control of operating supplies where actual cost of such supplies could be related to a budgeted cost figure established as a standard.

A warning is in order here. It's important to avoid selecting factors that can become self-defeating in terms of your over-all company objectives. For example, some plans use the factor of tool cost and equipment repair, measuring actual spending against budget.

Turn the page

brass tube fittings



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USE with copper, brass, aluminum, steel and plastic tubing. U.L. listed; A.G.A. approved. Meets SAE Hydraulic standards and A.S.A. and A.S.M.E. codes. PRESSURE RATING: up to 3000 p.s.i. Sizes: ⅛" to ¾".

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USE with copper, brass, aluminum and plastic tubing. No flaring, soldering, welding, or special tube preparation needed. PRESSURE RATING: up to 2000 p.s.i. Sizes: ⅛" to ¾".

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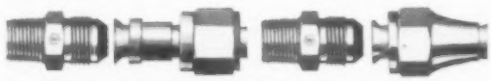

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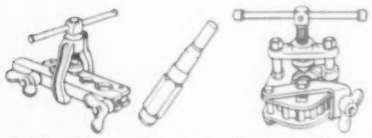

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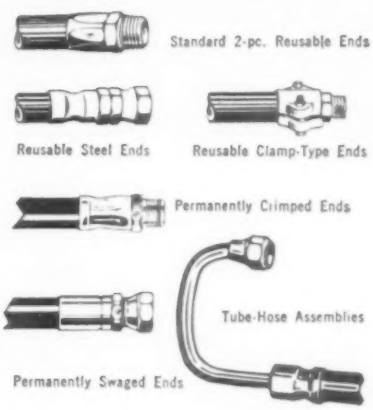

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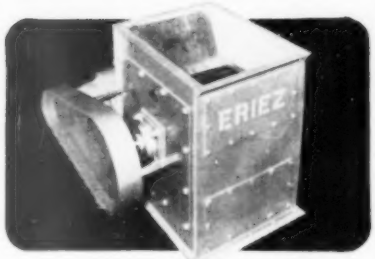

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SUPERVISOR INCENTIVES

Begins on page 204

This method motivates the supervisor to reduce tooling and repair costs. But it can be dangerous, because over-all costs may go up instead of down as too little money is spent on tooling and maintenance.

Here are other examples:

1. Use of labor turnover as a factor can backfire. It may encourage supervisors not to discharge employees in the occasional case where discharge is in order.

2. The number of written or formal grievances submitted by the union occasionally crops up. The supervisor can build a good record merely by giving in to the union steward. But most managements would question the soundness of encouraging supervisors along these lines.

3. Some plans use factors such as sales volume (for production) or insurance costs. The trouble here is that these are not really controlled by supervisors. Including them dilutes the motivating force of other factors and tends to make the bonus nothing but a gratuity.

4. Some plans use vague and general factors that defy objective measurement. One large chemical company uses 19 factors. Among these are job instruction, human relations, use of technical assistance, communications, resourcefulness, initiative, cooperation, stability, industry, dependability, and management attitude. These are good examples of what *not* to put in an incentive bonus plan.

DESIGNING THE PLAN

As a general rule the plan should be simple enough in mechanics to be easily understood by participants. But this does not necessarily mean that the simplest plan will be the best. You will certainly need several factors to cover the basic elements of the typical job.

It's also clear that some factors will have to be more significant than others. In general, for example, labor cost should rank higher than the factors of absenteeism or safety. But this is not always true. Safety may be of top importance in an electrical utility. This merely underlines the importance of

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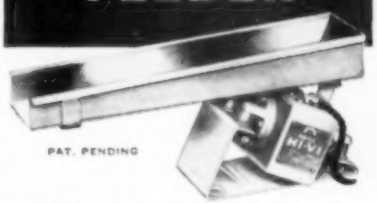

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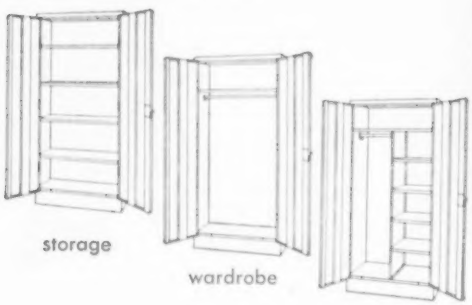

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These new Borroughs swinging-door cabinets are 36" wide, and have a central heavy-duty handle with Yale & Towne built-in lock. Doors have 3-point latching, and swing completely open for full accessibility. Shelves are adjustable on 2" centers without tools, nuts or bolts. Trim and clean-cut in design, these cabinets are ruggedly constructed throughout. The 3 models in the 78"-height answer most supply and storage requirements, while the 42" unit is perfect for use with counter-high installations. Send for all the facts today.

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selecting the appropriate factors for your own individual plant needs and weighing them accordingly.

A good rule of thumb is to think in terms of a plan that will provide bonus payments of 20 to 30% of base salary. Also to think in terms of some kind of ceiling to prevent excessive bonus payments due to "windfalls" or unusual conditions not due to supervisory effort.

Easiest way to build a ceiling into the plan is to set point credits for various performance levels as in the simple plan presented here. This provides good incentive but prevents "runaway" rates.

PAYING AWARDS

Men are best motivated to sustained good performance by hope or reward. For this reason, your plan should not result in salary reductions. Thus, if a foreman ends up with a minus score, he should get his regular base salary. Failure to earn a bonus should be the signal for higher management to work with the man to help him meet his goals and objectives in the future.

How often to pay the bonus is a sticky question. The most common approach—monthly payments—is not always the best. There is a real potential advantage to paying a bonus on an annual basis, at the same time giving the supervisor a monthly report on his accumulated point standing. This means he still knows how he is doing monthly.

The danger of making payments monthly is that they may come to be regarded as a regular part of salary. This way, the foreman may lift his scale of living and spend the bonus on regular monthly payments. Also, the bonus is apt to fluctuate from month to month because of varying operating conditions.

To get the most out of the award payments, consider paying them in a separate check, personally presented by a top management man.

DECIDING ON COVERAGE

Limiting incentive plans to production departments is risky. The supervisors of indirect departments such as maintenance, toolroom,

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This Standard Oil product made better grinding possible at Cessna

Aircraft Company's Industrial Products Division licked three problems with ARGON Oil No. 4

Situation: A fluid used in grinding operations at this Cessna plant at Hutchinson, Kansas, was creating three problems:

1) It washed the lubricant from regulator wheels and grinding fixtures, causing them to freeze.
2) It caused build-up of deposits.
3) It stripped paint from machine surfaces.

What was done: Cessna management called in a Standard Oil lubrication specialist who recommended ARGON Oil No. 4 in ratios of 100 and 150:1 for test. The coolant was tested in two centerless grinders for two months.

What happened: All three conditions which were hampering operations were cleared up when the switch was made to ARGON Oil No. 4. Cessna also found that work remained rust-free after passing through the machines, something that had not been the case before. They also found that the coolant didn't foam. With no foam, more of it stayed on the wheel, resulting in cooler operation. Faster cuts were obtained with finer wheels. All 12 grinders in the Cessna shop were then converted to ARGON Oil No. 4.

What you can do: Get more facts about ARGON Oil No. 4 from the Standard Oil office near you in any of the 15 Midwest or Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

Quick facts about **ARGON Oil No. 4**

• Clear, transparent fluid • Able to control corrosion and rust on work and machines • All chemical. Does not support bacteria growth • Unaffected by humidity • Fire resistant • Odorless

Jerry Croes, Standard Oil staff engineer, Paul Hoyer, Cessna section superintendent and Bill Ray, Standard Oil lubrication specialist (l. to r.) inspect rust-free finish after grinding with ARGON Oil No. 4 while J. E. Petrie (far left), operator, looks on. Both Jerry Croes and Bill Ray have plenty of experience in this sort of work. Jerry has been at it for 16 years. He has an engineering degree from South Dakota School of Mines & Technology and has completed the Standard Oil Sales Engineering School. Bill has six years service working with industrial customers.

You expect more from **STANDARD** *and you get it!*

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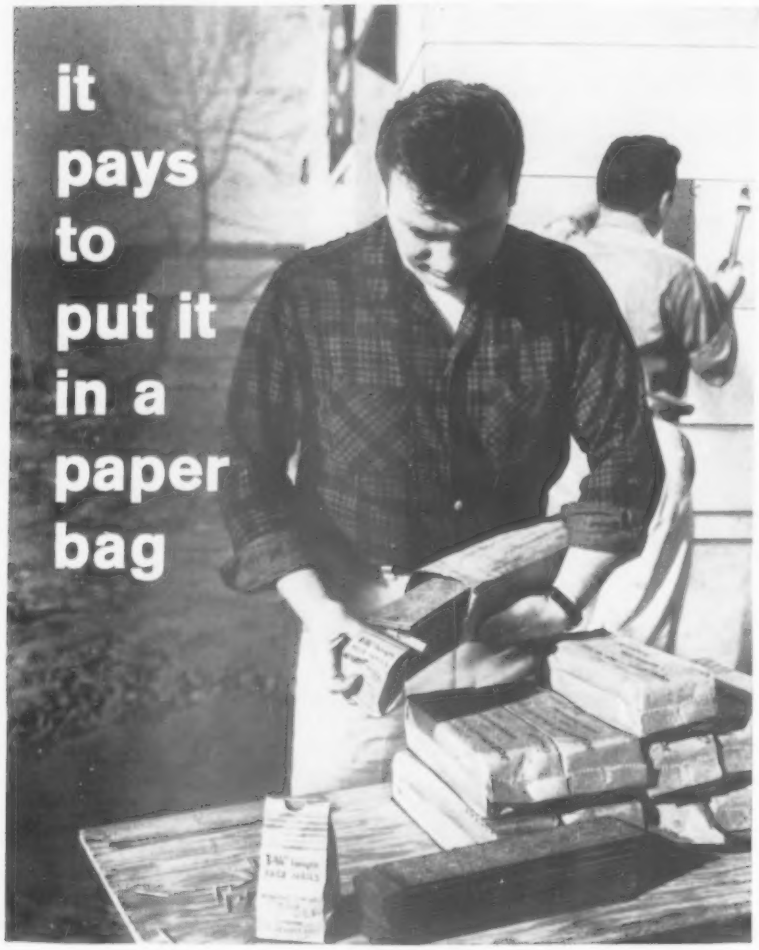

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Begins on page 204

purchasing, and accounting will inevitably feel they're being discriminated against. Result is that higher management often tends to give these indirect supervisors extra salary consideration to compensate for the lack of bonus opportunity. As you can see, this practice is self-defeating and only creates antagonism if the supervisors eligible for bonus learn of the salary differentials (as they surely will).

It's far better to analyze the different departments and develop meaningful factors that can be measured objectively. For example, in one plant the maintenance department plan was built around these factors:

1. Indirect labor budget (actual indirect labor divided by budgeted indirect labor).
2. Performance within estimate on tool and equipment orders (actual cost of completed tool and equipment orders divided by estimated cost of same orders).
3. Materials and supplies (actual usage and shrinkage of materials and supplies divided by their budgeted value).
4. Safety.
5. Absenteeism.

Your objective should be to cover all supervision. This means your starting point should be the smallest organizational unit for which separate records are kept. Each such unit or department typically will have a foreman or supervisor in charge. But large departments may well have additional supervision. In such cases, the plan can have a group application, with each of several supervisors receiving the same point total. Naturally the bonus would vary with their salaries.

In the same manner the plan can be extended to higher level supervision such as general foremen and general superintendents. In such cases, the departments under these men can be considered as a single unit in applying the plan.

PRE-TESTING THE PLAN

Pre-testing your supervisory incentive plan is your best insurance against later trouble. The simplest way to do this is to give the plan a

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PRODUCTION WISE

There's no room in this busy shop area for aisle-filling floor-type handling equipment. But, an economical Borg-Warner 5-Ton Crane System transports materials and work swiftly, smoothly and quietly with minimum interference to production.

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- **The "KEX" Service is engineered to suit your needs**—provides the right size, right type towel for each individual job need.
- **Saves countless man-hours of labor**—through proper installation and systematic servicing.
- **Regular pickup and delivery increases efficiency**—no time-consuming disposal problems, reduced fire hazard for extra safety.
- **"KEX" towels absorb up to 6 times their own weight**—are uniformly bound with no loose ends to catch in machinery, are germ-free and strong enough to withstand hardest use.

Investigate the benefits of "KEX". "KEX" is a national service available through locally owned independent franchised dealers like Penn Overall Supply Company which services Columbia Steel & Shafting.

See "Wiping Cloths" or write to "KEX" National Service, 295 Fifth Avenue, New York 16, N. Y.

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"dry run." You can do this by applying it retroactively over a representative period of time to all affected departments. This way, you'll get a picture of how much bonus would have been earned.

In the course of this dry run you will quickly learn whether you have clearly defined the standards of measurement. You can also determine how readily you can pick up the necessary figures from company records and reports.

Another type of dry run may also be helpful. In this you can test the plan by anticipating the most favorable possible future conditions and the most effective supervisory performance. These figures will show you what optimum bonus earnings would be. This is a useful procedure if you decide not to impose a ceiling on the plan.

INSTALLING THE PLAN

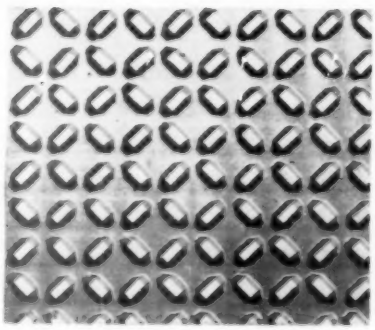
If the supervisors covered by an incentive plan don't understand it and don't believe it's fair and honest, it's almost certain to be a failure. The implications of this industrial fact of life are clear: The plan should be thoroughly explained to supervisors before it's put into effect. The best way to do this is to make the presentation personally to small groups. The explanation should be careful, plenty of examples should be used, questions should be answered, and each man should be given a copy of the plan.

Once the plan is in, it's wise to resist the temptation to tinker with it. Nothing is more upsetting to supervision than changes in the middle of a bonus period.

As a general rule you will get best results if you guarantee that the plan will operate unchanged for the first year. After that, there is logic in reviewing it to make sure that it's achieving the intended results and is fair to the supervisory group and the company.

The key to a successful installation basically is mutual confidence. If your actions during the process of developing the plan and explaining it to supervision convince them your motives are good, you can count on good results. **END**

One slip can cost more than USS Multigrip



Your workers stand—and often fall—in slippery places. Falls account for about 1 in every 5 industrial injuries.

You can eliminate many slips and falls by installing USS Multigrip Floor Plate around machines, on loading platforms, stair treads and main shop aisles.

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For more information about USS Multigrip Floor Plate, write United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

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... *inexpensive* Fenwal Temperature Controls solve hundreds of temperature control problems

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The 541 Temperature Indicator Controller installs in minutes . . . sets with a turn of the control knob. Available in 5 temperature ranges, it provides every detail for *your* particular needs, *from tamper-proof control adjustments to large, easy-to-read dial!*

And for long, dependable performance, nothing matches the 535 Temperature Controller. Thermistor sensor with virtually unlimited life feeds into rugged, transistorized printed circuit. *High precision . . . troublefree operation!*

Ask *your* Fenwal Distributor about economical Fenwal Controls. Also send for helpful booklet: Precision Temperature Control in Industrial Plants. Write Fenwal Incorporated, 2510 Pleasant Street, Ashland, Massachusetts.

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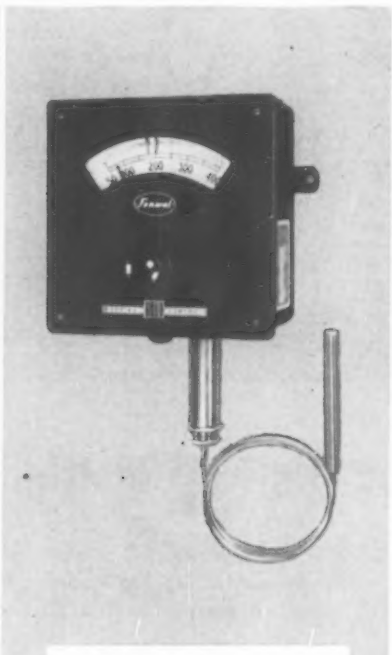
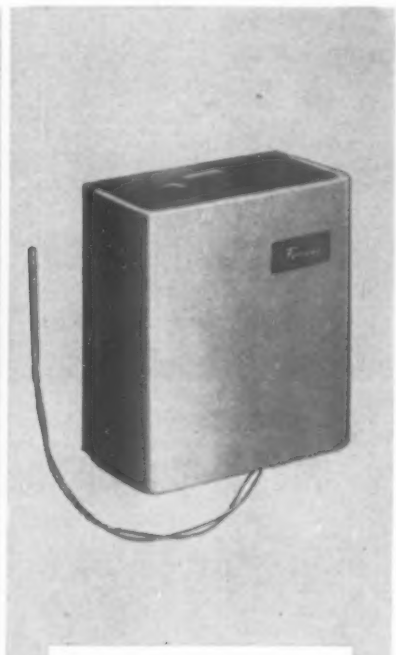


The Model 541 Liquid-Filled Bulb and Capillary Tube Temperature Indicator Controller has welded steel, splash and dust resistant case. All moving parts in unit operate in opposition . . . compensate for wear and keep precision high.



The Model 535 Temperature Controller has no moving parts . . . nothing to wear out. Sensor mounts up to hundreds of feet from control unit. A compact, fast-acting instrument with "solid state" components, for close control of temperature.

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1—Hydraulic Valves. A 20-page, four-color manual (No. 230) tells how to choose pressure-controlled hydraulic valves. Color cutaways detail valve interiors, text describes design, curves give flow and pressure ratings. *Rivett, Inc.*

2—Control Valves. Bulletin 150 (20 pages) describes a complete line of shut-off and throttling valves. Gives sizing data, material and flow characteristics, plus rundown on "Eccentric Principle." Useful diagrams. *DeZurik Corp.*

3—Feedback Control Valves. Two new series of mechanical feedback valves are discussed in Catalog 310. Eight pages cover operating principles, design features, dimensions, and applications for servo-controls. *Moog Servocontrols, Inc.*

4—Rigid Plastic Pipe. Bulletin CE-80 has 16 pages of details on chemical-resistant pipe Type-I ABS —a blend of plastic and rubber. Also lists fittings and valves. *American Hard Rubber Co.*

AUXILIARY

5—Vertical Air Compressor. Bulletin A-62 (24 pages) tells about class WN-112 stationary units. Contains specifications, cross-section drawings, and installation photos of vertical compressors delivering up to 125 psi. *Joy Mfg. Co.*

6—Turbine-Type Pumps. Colorful 4-pager (Bulletin 08B9409) describes design and application of vertically mounted, turbine-type pumps; gives advantages. In 40 sizes from 20 to 8000 gpm. at heads to 400 ft. *Allis-Chalmers Mfg. Co.*

7—Oil-Gas Burners. This 6-pager explains operation of combination burner. Illustrates mixing nozzles, flow of fuels and air, installation on packaged-type boiler. *Boiler Engineering & Supply Co.*

8—Heat Exchangers. Features six standard types of heat exchangers. Bulletin B-20 (20 pages) includes mechanical design data, thermal rating tables, and graphs showing heat transfer and pressure curves. *Struthers Wells Corp.*

9—Air Motors, Controls. Full-color photos show motors performing work-holding, tool-positioning, and material-handling functions equipment. This 16-pager (ML-5) also lists useful customer services available. *The Bellows Co.*

ELECTRICAL

10—Power Switching Centers. "Building block" concept in electrical switching is illustrated in 20-page Bulletin No. 1616A. Standard components make up 4.8- to 14.4-kv. units. Specifications and designs. *I-T-E Circuit Breaker Co.*

11—Inverter-Diverter Power. Continuous a-c and d-c power system is explained in Bulletin 21-200 (6 pages). Sketches show normal motor generator set-up; emergency battery power features. Wiring diagrams. *Electric Products Co.*

12—Fluorescent Floodlights. Bulletin GEC-1487B in 6 pages describes Fluoroflood fluorescent floodlights for loading areas, service yards. Suggests mountings, gives photometric and light distribution data. *General Electric Co.*

13—Silver-Cadmium Batteries. Technical brochure tells about advantages of batteries with silver-cadmium plates. Also explains how they work. Graphs and tables give electrical characteristics, sizes, and models. *Yardney Electric Corp.*

14—Radioactivity Monitors. Radiation detectors are described in 16-page Bulletin M-59. Features seven systems using a single detector sensitive to all rays. Photos and specifications for typical installations. *Nuclear Measurements Corp.*

15—Packaged Transformer. The "Flexoformer," is a "do-it-yourself" a-c voltage source or current transformer. Four-color Bulletin TP659 (8 pages) describes how to add secondary winding, gives useful diagrams. *Superior Electric Co.*

16—Brushless Generators. Ratings from 40- to 300-kw. are described in 4-page Bulletin 51B9192. Tells how voltage variation is kept within ±½% regardless of load. Photos. *Allis-Chalmers Mfg. Co.*

17—Underfloor Wiring. Form No. 692, a 4-pager, shows how these wiring systems are used with cellular steel flooring. Application photos, sketches, and dimensions detail two variations of the "Headerduct" system. *H. K. Porter Co., Inc.*

18—Gearmotors. Bulletin J-17 (32 pages) shows horizontal or vertical mounting types with capacities to 125 hp. at speeds from 1.2 to 780 rpm. Technical data plus extensive tables on load characteristics, selection. *Hewitt-Robins, Inc.*

19—Reduced-Voltage Starters. Eight-page Bulletin GEA-6860 tells all about them. Illustrations and diagrams show how to apply. Comparison and selection tables will help you pick best one for each need. *General Electric Co.*

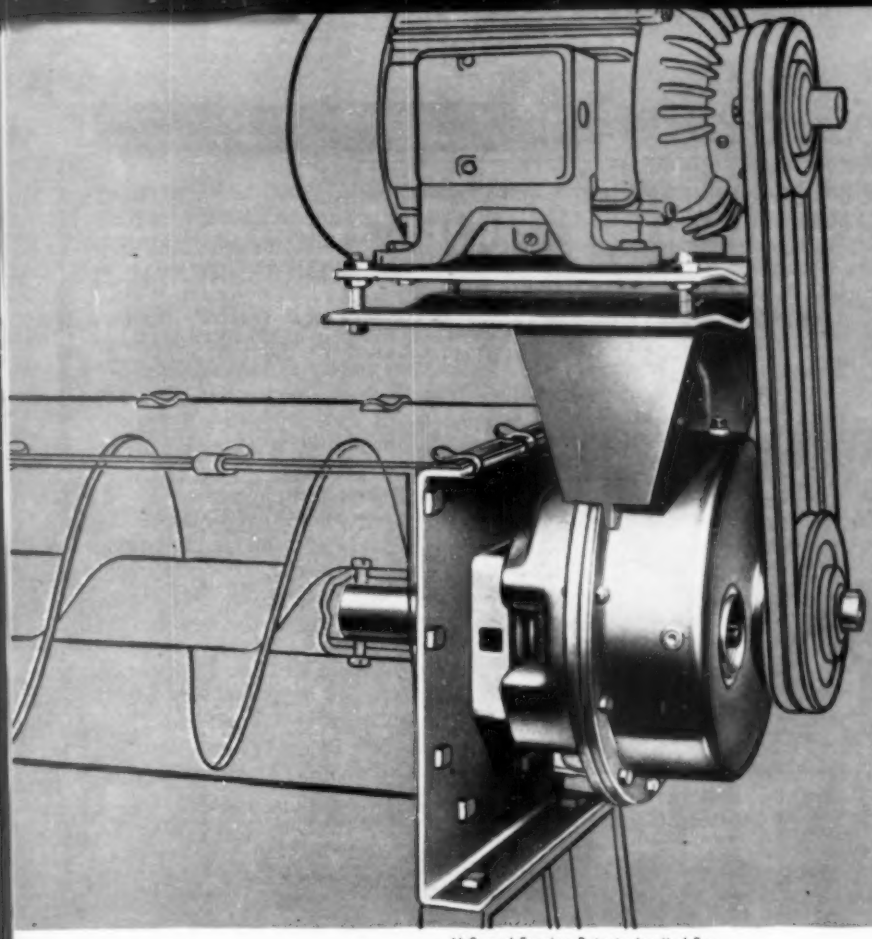
BUILDINGS

20—Windows and Walls. Three catalogs give detailed information on aluminum windows (A-59), steel windows and doors (S-59), curtain wall systems (C-59). Include sectional views, layouts, architectural data. *William Bayley Co.*

21—Radiant-Heat Construction. Eight-pager reports on use of radiant-heat slab construction. Sketches show position of pipe coils in slab, installation above and below ground. Digests construction methods, too. *A. M. Byers Co.*

Turn the page

For more facts Circle 583 on Reader Service Card ➤



NEW! FALK Screw Conveyor Drive

U.S. and Foreign Patents Applied For

—the drive our customers asked for

Our customers helped us design this new unit. We sent our men into the field to find out what our customers needed in a screw conveyor drive—then our engineers designed a new drive that offers the maximum of service, versatility, operating economy and long life. Here are some of its outstanding features:

A COMPLETE DRIVE: Saves engineering and assembly time. Six sizes to cover entire range—each with these ratios: — 4:1, 9:1, 14:1 and 24:1. Bolts to any standard trough end—eliminates trough end bearing. Eliminates drive shaft wobble. Efficient FALK single helical gears.

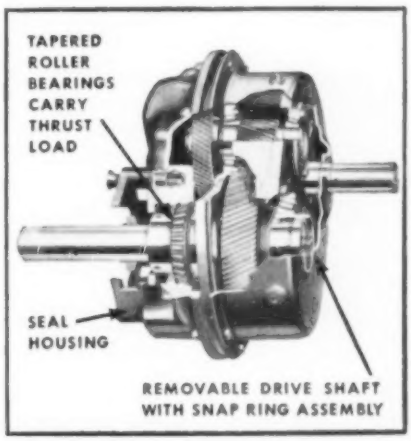
SEAL HOUSINGS: Choice of seals (neoprene or leather lip, felt or waste) to accommodate material conveyed. Space between trough seal and unit seal prevents conveyed material from reaching unit seal.

REMOVABLE DRIVE SHAFT: Snap ring assembly permits easy removal. Five sizes, from 1½" to 3 7/16".

TROUGH END: Can be fastened to any standard trough. Eight sizes, from 6" to 20".

ALL-STEEL MOTOR MOUNT: Saves costly engineering and installation time and costs; no motor plates to design or fabricate. Motor can be mounted in virtually any position. Pre-drilled to accommodate NEMA standard motors ½ to 30 HP.

AN IMPORTANT ECONOMY: Buy only what you need—the basic reducer alone, or with trough end and/or motor mount. For detailed information, contact your Falk Representative or Distributor—or ***write direct for Bulletin 7106.***



THE FALK CORPORATION, MILWAUKEE 1, WISCONSIN

MANUFACTURERS OF QUALITY GEAR DRIVES AND FLEXIBLE SHAFT COUPLINGS

Representatives and Distributors in most principal cities

FALK is a registered trademark

FALK

...a good name in industry

22—Fire-Alarm Systems. A 76-page manual (F249) describes "Flex-alarm" system of fire alarms, signal systems, automatic alarm controls. Many pictorial diagrams. Complete nomenclature and wiring for devices. *The Gamewell Corp.*

23—Cooling Towers. The Econ-O-Mizer line of cooling towers is featured in Catalog 362. Four pages describe new plastic horizontal deck that won't rot or grow fungus. Gives size, weight, and capacities. *Acme Industries, Inc.*

24—Make-Up Air. Design and equipment selection to replace air drawn from rooms by exhaust fans is subject of 4-page Bulletin En-5911. Folder gives step-by-step instructions, describes equipment, explains controls needed. *Reznor Mfg. Co.*

25—Grade Crossing Pads. Sizes, maintenance, and costs of rubber shock-absorbing pads are discussed in two 8-page folders. Step-by-step photos, plus drawings and specifications give installation details. *Goodyear Tire & Rubber Co.*

PRODUCTION

26—Grinding Wheels. Built-in safety guard for portable grinding wheels is featured in 4-pager. Catalog A-1523 gives sizes, shapes, grit combinations, grit range, and applications. *The Carborundum Co.*

27—Turret-Drilling Machines. Catalog No. 1T has 21 pages on design and construction features of new turret drills and work-positioning tables. Explains how six spindles work on one axis for quick indexing. *Brown & Sharpe Mfg. Co.*

28—Spiral Point Drilling. Booklet (24 pages) describes theory and practice of converting standard twist drills to spiral points for ultra-precision work. Also shows how to use Spiropoint drill sharpener. *Cincinnati Lathe & Tool Co.*

29—Indexing Tables. Three cam-operated indexing units are featured in this 25-pager. Complete drawings show how to attach to existing machine tools. Tables give index positions, cam details, and load factors. *Standard Tool & Mfg. Co.*

30—Liquid Spray Buffing. Bulletin LIQ 600 describes features of "Liquabrade" spray buffing. In 16 pages explains in detail how it works, typical set-ups and equipment needed. *Lea Mfg. Co.*

31—Flame Cutter. Oxweld CM-60, a flame-cutter that cuts intricate parts from same-size drawings by photoelectric guidance, is described in 8-page booklet, No. F-1294. Illustrations and text show advantages and uses. *Linde Co.*

32—Automatic Production Lathes. Operation of three Masterline hydraulic automatic lathes are detailed in 24-page booklet No. 1213. Contains specifications, capacities, accessories, and sample floor plans. *Gisholt Machine Co.*

33—Descaling Machines. This 20-page Bulletin No. 609 tells all about the "Rotoblast" system for descaling sheets, beams, rods, and pipe. Photos, diagrams, and cutaways show features of both 4- and 8-wheel machines. *Pangborn Corp.*

34—Eyelets and Eyeleting. Comprehensive 48-page catalog covers industrial eyelets and eyeleting machines. Details data on several classes of eyelets and suggests applications. Also lists sizes available. *United Shoe Machinery Corp.*

35—Stud Welding. Case histories on cost cutting through stud welding are included in this 12-pager. Shows uses of stud welding on widely varying jobs. Cost-reduction worksheet helps figure savings. *Gregory Industries, Inc.*

36—Inventory Control. Four colors and 12 pages illustrate Kardex system for inventory control, other visible record-keepers. Describes advantages of punched card and tape tie-in. Shows forms, cards, cabinets. *Remington Rand, Inc.*

37—Marking Machines. Special 12-page catalog tells how to mark electrical and electronic products at rates up to 8000 units an hour. These high-speed machines imprint flat, round, or irregular surfaces. Photos. *Markem Machine Co.*

38—Electronic Tracer. Follows simple pencil sketches to guide oxygen cutting machine through intricate shapes and forms. Bulletin explains how it works, automatic adjustment and controls. *Linde Co.*

39—Replacement Formula. This 12-pager offers a method for appraising productivity of machine tools using "avoidable costs" as replacement basis. Includes 4-page worksheet. *Jones & Lamson Machine Co.*

40—Nitriding Process. Liquid pressure process for producing an extremely hard case on steel parts is described in this 8-page bulletin (No. 204). Has photos, graphs, drawings, and decarburization data. *The A. F. Holden Co.*

41—Welding Equipment. Fully and semi-automatic arc-welding machines are illustrated in 24-page Catalog EW-209. Covers machine power units and accessories for gas, diesel, electric motor, and transformer arc welders. *Hobart Bros Co.*

MAINTENANCE

42—Safety Products. Catalog folio of 40 pages presents a wide line of safety glasses, goggles, lenses, vision testers and ear protectors. Catalog No. A-1762 illustrates each item, gives specifications. *Bausch & Lomb Optical Co.*

43—Power Floor Sweepers. Two 4-pagers tell about sweeping machines. Catalog No. 743 describes rider-type; No. 727, the walking type. Shows machines in use, suggests application. Data on optional equipment. *Clarke Floor Machine Co.*

44—Heater Tube Protectors. Folder No. P-355 (4 pages) shows how nylon, polyethylene, and phenolic tubing prevent corrosion of condenser and heat-exchanger tubes. Sketches illustrate how they work. Includes sizes. *Crane Packing Co.*

Turn to page 221

THERE MUST BE AN EASIER WAY

SUPPLYING BRANCHES AND SUBCONTRACTORS WITH BLUEPRINTS —IT'S EITHER A FAMINE OR A FEAST
WHAT'S THAT —WE DIDN'T SEND ENOUGH PRINTS FOR HALF YOUR MEN AT CAPE CANAVERAL?
LAST WEEK HE SENT 200 TO A GUY WHO NEEDED ONLY ONE
HOW DOES HE DECIDE—FLIP A COIN OR SPIN A ROULETTE WHEEL?
WE COULD THROW A BRAWL WITH THE AIR MAIL CHARGES ON THAT STACK MAZIE'S SENDING OUT
I KEEP TELLING HIM IF WE HAD A BLUEPRINTER MAKE AUTOPOSITIVE PAPER INTERMEDIATES WE'D ONLY HAVE TO SEND ONE OF THEM TO EVERYONE

Much easier for you, and much less costly, too, when you mail a Kodagraph Autopositive Paper intermediate instead of a bundle of blueprints.

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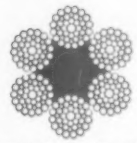
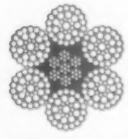
YOU CAN'T BARGAIN WITH SAFETY

WICKWIRE ROPES FOR INDUSTRIAL USE

6 x 25 Filler Wire, FC



6 x 41 Filler Wire, FC



6 x 46 Filler Wire, IWRC

For detailed recommendations, write the nearest CF&I sales office and ask for WR 722.

For safety and performance
. . . order CF&I-WICKWIRE
"job-designed" wire ropes

The Image of CF&I—a giant steelman—stands for the rigid quality-controls and testing procedures that are carried out in the production of Wickwire Rope. This Image also reflects CF&I's ability to design a specific product to meet a particular need.

These are the very reasons why CF&I-Wickwire Ropes are both *safe*—as only a *quality* wire rope can be—and *suitable*—because they are available in a *complete range* of wire grades, types, sizes and constructions, designed to meet each industry's requirements.

Avoid the losses—due to injuries and wrecked equipment—that can occur when a "bargain" rope fails. Buy a quality wire rope that's designed for the job it must do—a CF&I-Wickwire Rope.

WICKWIRE ROPE
THE COLORADO FUEL AND IRON CORPORATION

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In the West: **THE COLORADO FUEL AND IRON CORPORATION**—Albuquerque • Amarillo • Billings • Boise • Butte • Denver El Paso • Farmington (N. M.) • Ft. Worth • Houston • Kansas City • Lincoln • Los Angeles • Oakland • Odessa (Tex.) Oklahoma City • Phoenix • Portland • Pueblo • Salt Lake City • San Francisco • San Leandro • Seattle • Spokane • Tulsa • Wichita
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6794-G

For more facts Circle 585 on Reader Service Card

For more about these items, circle item numbers on Reader Service Card next to back cover.

45—Arc Welding Accessories. This 12-page catalog (No. 12) shows the "Tweco" line of cables, connectors, and accessories. Photos and sketches illustrate uses of connectors, clamps, splicers. Includes specifications. *Tweco Products, Inc.*

46—Blower-Vacuum Cleaners. Portable hand models, roll-along tanks and drum conversion units for industrial cleaning service are described in 4-page folder. It suggests applications and shows optional equipment. *Ace-Sycamore, Inc.*

47—Metal Cleaning. Catalog (32 pages) covers all aspects of cleaning and preparation of metal surfaces. Over 100 types of equipment and methods are shown for degreasing, washing, pickling and coating. *Magnus Chemical Co.*

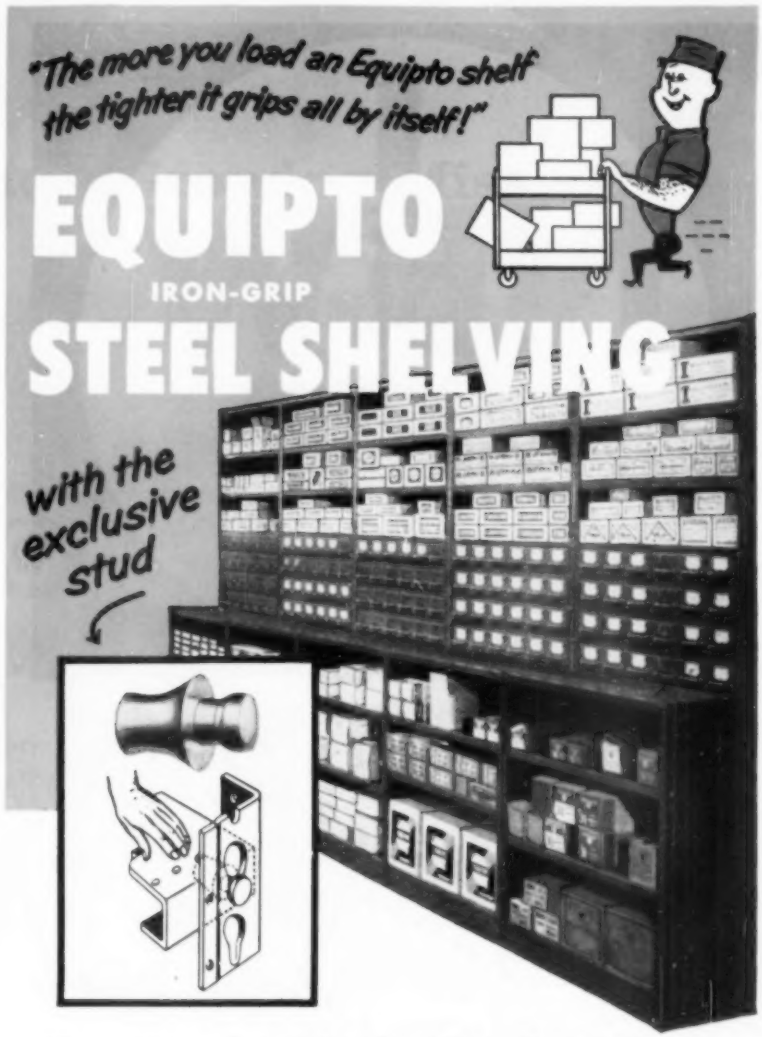
48—Spring Clutches. Five standard lines of spring clutches for machines and instruments are detailed in 30 pages. Bore sizes are from ⅛- to 1-in., torque capacity up to 1250 lb.-in. Gives technical and application data for drives to 5 hp. *Curtiss-Wright Corp.*

INSTRUMENTS AND CONTROLS

49—Air Measuring. Catalog No. 59D (32 pages) tells all about pneumatic dimensioning gages. Many illustrations show how to use Dimensionair system with two new models. Includes specifications and diagrams. *Federal Products Corp.*

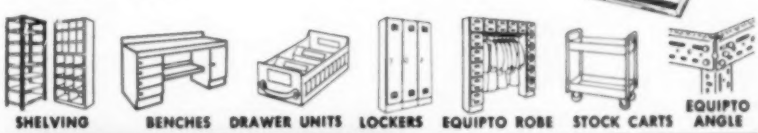
50—Process Controls. An 8-page bulletin (No. 5) surveys a line of flow meters, continuous weighers, fluid and dry feeders and blenders. Gives general information and also illustrates various models. *B-I-F Industries, Inc.*

51—Time-Cycle Controls. Bulletin C311 in 12 pages explains how time-cycle controller (Model C1C500) regulates batch processes. Specifica-


"The more you load an Equipto shelf the tighter it grips all by itself!"
EQUIPTO
IRON-GRIP
STEEL SHELVING
with the exclusive stud

No nuts, bolts or tools needed when adjusting Equipto Iron-Grip Shelving. Exclusive steel stud permits 60% faster shelf adjustment on 1½" centers. The more you load it, the tighter it grips, yet shelf may be moved easily. You can vary arrangement of drawers, dividers, or shelves to suit changing storage needs. Four uprights per unit allow units to be moved without disturbing adjacent units.

Equipto Iron-Grip Shelving is immediately available from stock in all sizes, either open or closed, with or without dividers, bin fronts, drawers or label holders. Write today for complete reference manual No. 485; also free booklet "HOW TO SOLVE YOUR STORAGE PROBLEMS".



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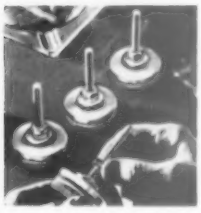
UNISORB LEVEL-RITE "200"

MOUNT SPEEDS INSTALLATION, ABSORBS VIBRATION FOR OFFICE AND PLANT EQUIPMENT

Now . . . simple, fast and secure mounting — plus vibration control — for all types of light machinery and equipment with the new all-purpose UNISORB LEVEL-RITE® "200" MOUNT. Handles loadings up to 200 psi.



Look at these "200" features . . .

- Fast, simplified and precise leveling
- Free-floating screw post, compensates for uneven or pitched floors
- Safe, sure grip. Can be cemented if needed. No damage to floors, no bolting or lagging
- Exceptional vibration control — stops up to 85% of transmitted vibration
- Lowers noise level, reduces worker fatigue
- Machine can be moved at any time

Try this modern Unisorb Level-Rite "200" Mount now!
Send for complete details and order form today.

UNISORB 206 SOUTH STREET BOSTON 11, MASS.
Division of The FELTERS Company

Want more information? Send for set of Unisorb "Facts" Books!

Please send me a Unisorb Sample and Free Book.

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Name .....
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FEB-44

For more about these items, circle item numbers on Reader Service Card next to back cover.

tions on timing disks, cam drives, switches, accessories. Illustrations and drawings. *Bristol Co.*

52—Process Instrumentation. All-electric combustion control systems and measuring devices for processes and electronic recording systems are illustrated in 8-pager (No. 59-C091). *The Hays Corp.*

53—Hydrostatic Measurement. An 88-pager gives principles of hydrostatic measurement of fluid height, specific gravity. Tells how to select instruments, design control systems. Many pages of useful data, diagrams. *Petrometer Corp.*

MATERIAL HANDLING

54—Rope and Slings. Four 4-page pamphlets cover steel wire rope, slings, and clamps for lifting and hauling. Booklets describe each product, suggest applications, list size and strength specifications. *Jones & Laughlin Steel Corp.*

55—Dumping Equipment. Four machines for dumping material from boxes, bags, and barrels are featured in 6-page folder. Illustrations show dumpers in action. Tables cover dimensions, capacities up to 5000 lb. *Conveyors and Dumpers, Inc.*

56—Fork Trucks. A 24-pager describes five models in the Pace-Maker series of fork-lift trucks. Booklet SP-23 outlines steering, shifting, and hydraulic control features. Also gives capacities and dimensions. *Towmotor Corp.*

57—High-Speed Weighing. Check-weigher, an automatic system of weighing items on conveyors, is illustrated in 4-page Form 2968. Describes weight capacity, accuracy, speed. Photos of optional pilot lights counters. *Toledo Scale Corp.*

58—Fiber Containers. Six cases show how vulcanized fiber trays, tote pans, and re-usable barrels cut costs.

Turn the page

Know Growing Mississippi

Where there's Room for Business and Time for Living

Good living and good business go hand in hand in Mississippi. And one important factor is Mississippi's moderate climate. With an annual mean temperature of 64.5 and average snowfall of less than one day per year, you never have to worry about costly plant shutdowns and worker absenteeism due to bad weather. Then, too, Mississippi's mild climate permits pleasant, year-round recreational activities. Here workers give their best because they live their best. If you are looking for a profitable site for your new plant, let Mississippi share with you its many advantages for brisk business and pleasant living.

Mississippi

For full information, write Mississippi Agricultural and Industrial Board, 1504 Woolfolk Building, Jackson, Mississippi.

EXPLOSION PROOF
CLASS I GROUP D
POWERED LIFT TRUCKS

Underwriters' Laboratories, Inc. INSPECTED TYPE EX REVOLVATOR COMPANY

APPROVED and PROVEN

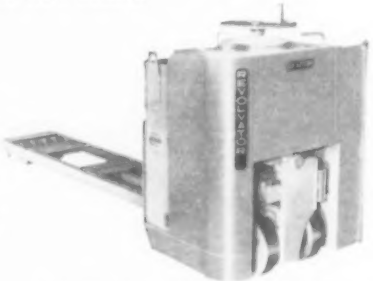
8 YEARS ON THE JOB

Since 1951 Revolvator Go-Getters, designed for this service, have been specifically approved by leading industrial insurance companies for use in Class I Group D explosion hazardous areas in major plants from coast to coast. User comments like those below show that the Go-Getter has been more than approved by safety authorities . . . it has been proven in use for eight years.

The Plant Manager where the Go-Getter at the left is used says, "In an area where we have explosive fumes, aluminum choloride dust and hydrochloric acid fumes what was previously a difficult, disagreeable job for two men is now easy for one."

Air in the color mixing room of the finishing plant where the Go-Getter above is used carries organic dusts as well as explosive fumes. The foreman says, "The men like the Go-Getter and use it steadily."

Executives in the chemical plant where the model to the right is used say, "We use the Go-Getter in our area which has the most severe hazard." Another plant where quantities of explosive solvents are used for "wash down" reports of a similar model, "We are well pleased and we are ordering another Go-Getter."



A major insurance association writes, "We are quite willing to accept the unit (Go-Getter) as it is designed with explosion proof housings for the motors and controls as usually specified for electrical equipment that can be safely used in explosion hazardous areas."

A nationally known safety engineer writes, " . . . calling the existence of this line of trucks to the attention of the industry as we believe many would want to know about this equipment."

The Go-Getter is the latest addition to a complete line of materials handling equipment for use in explosion hazardous areas that Revolvator has been building for over a quarter of a century.

REVOLVATOR CO.
8761 TONNELE AVENUE, NORTH BERGEN, N. J.
SINCE 1904

FACTORY / CATALOG NEWS

Begins on page 216

For more about these items, circle item numbers on Reader Service Card next to back cover.

Catalog in 6 pages covers complete line, points up durability, strength, weight features. *National Vulcanized Fibre Co.*

59—Warehouse Layout. Pros and cons of narrow *vs.* wide-aisle warehouse construction are reviewed with Automatic fork trucks in mind. Eight-pager shows type for each situation, pictures 13 models in use. *Automatic Transportation Co.*

60—Handling Units. This 16-pager (80-204) illustrates the L-S line of handling equipment from hand trucks to electrically powered stackers. Dimensions, capacities, unique "selector index," photos. *Lewis-Shepard Products, Inc.*

61—Industrial Trucks. Lift trucks, straddle carriers, and yard cranes for handling loads to 40,000 lb. are described in an 8-pager. Table lists 43 attachments and accessories, shows at a glance what can be added to each truck. *Hyster Co.*

62—Air Vibrators. Bulletin 303 (4 pages) tells how to use air vibrators to move bulky material through bins, chutes, and hoppers. Illustrations and data on eight models. *National Air Vibrator Co.*

63—Electric Industrial Trucks. An 18-page catalog tells major features and advantages of battery-operated trucks. Material comes from a survey of users. *Electric Industrial Truck and Allied Products Mfrs.*

64—Hoist Standards. Minimum specifications for electrically powered wire-rope hoists are given in this 8-pager. Describes all operating parts. Will help you select needed features when buying a hoist. *Hoist Mfrs. Assn., Inc.*

65—Enclosed Conveyors. A 4-pager (2813) gives data on fully enclosed, self-cleaning flight conveyors to handle free-flowing, granular, non-abrasive bulk materials traveling horizontally or at limited inclined paths. *Link-Belt Co.*

first in silicones

Dow Corning

SILICONE NEWS

production and maintenance edition • No. 31

$4800 SAVED BY "GOLDEN EGG"

Stepped-up production can mean overloaded motors, which in turn can result in chronic motor failures. While new motors of higher rating will take care of this situation there's often a far less expensive way out.

A Michigan foundry uses three cranes to feed cupolas and do regular yard work. A speed-up in production caused the Class A crane motors to fail immediately. Not too keen on spending $7200 for new mill-type motors, management solved the problem for only $2400. How? By having all three motors rewound with Dow Corning Silicones, saving the company $4800. What about performance? The latest report is that the cranes operate 16 hours a day, handling a heavier cupola schedule, plus normal yard work. There hasn't been a single insulation failure since silicone materials were installed back in 1952.

When your motors give trouble, call the service shop that displays the emblem shown at left.

This emblem identifies the shop that rewinds motors with quality materials made with Dow Corning Silicones. Motors with this emblem provide more power, more overload capacity, longer service and require less maintenance.

The protection silicones give against heat, moisture, weathering, corona, dust and abrasive action is your guarantee of greater motor life. Specify silicone rewinds to save your company money and headaches. And remember: only rewind shops displaying the golden symbol of quality are qualified to give you approved Dow Corning silicone service. *No. 747*

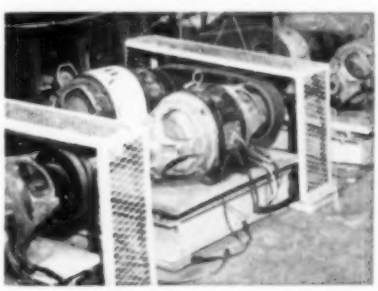
GLOVELESS GLOVE

Working with greases, oils, solvents and detergents can lead to dermatitis . . . and many lost man hours. The wearing of protective gloves will help, but this isn't always feasible.

In one operation at a large aircraft plant, for example, metallic parts are bathed in a kerosene solution. All employees on this operation are women and all contracted some degree of dermatitis. Because of the smallness of the parts and the solvent used, wearing rubber or plastic gloves was out of the question.

After lengthy testing, the firm finally found excellent results with a protective hand lotion. The lotion: Silicare, a product of Revlon, Inc., containing a generous amount of Dow Corning Silicones. The finding: When hands were protected with Silicare, all employees involved reported normal skin color and absence of swelling. It was quickly accepted by the women as an easily applied, good-feeling product. Silicone containing Silicare solved the problem by acting as a "gloveless glove".

Silicones can do this because they form a lasting barrier against many irritants, keeping hands soft and smooth. They're never greasy . . . won't make skin feel oily or slippery. Perhaps a lotion containing Dow Corning Silicones can help you eliminate skin irritation at your plant. Why not give it a try? *No. 748*



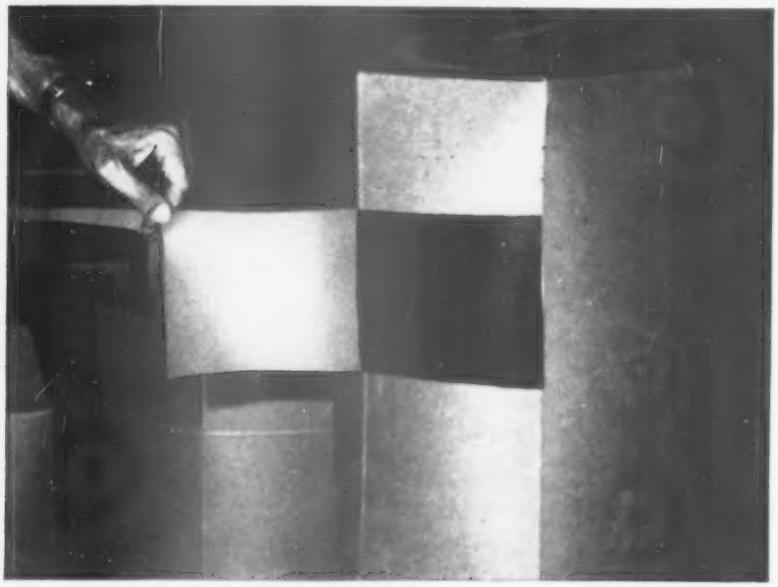
Motor Methuselah

Over 13 years ago — June 6, 1946, at 10 a. m.—a motor test began in the Dow Corning laboratories. Today the test motor is still running after more than 85,000 hours of operation at extreme overload which produces temperatures of 240 C.

The 10 hp motor is insulated with Dow Corning silicone materials (Class H) and generator loaded to operate (Cont. pg. 2)

FOR DATA RELATING TO THESE ARTICLES, CIRCLE REFERENCE NUMBER IN COUPON ON NEXT PAGE OR REFERENCE NUMBER ON READER SERVICE CARD

MORE



STICKY PRODUCTS COME OFF IT

If you can't release sticky products from containers or wrapping, it means wasted material and lost time. Here's helpful news on how to avoid such waste.

Trumbull Asphalt Company of Delaware is a major independent producer of asphalt, a material that's especially hard to handle. In packaging for shipment, they pour 100 pounds of asphalt at 350 F into cartons, then cool it for 48 hours. Considering this heat and the 100 lb. pressure, you might ask: how is the asphalt ever removed from the cartons? Why doesn't it stick like crazy?

Normally, it would. But at Trumbull, the problem doesn't exist . . . their kraft containers are coated with Syl-off, the Dow Corning silicone paper treatment. Practically nothing will stick to this coating, asphalt included; Syl-off gives really amazing release. Trumbull finds that it does a much better job than the clay coated paper they formerly used.

The silicone coating is applied by National Container Corporation, whose engineers also have a good word for Syl-off. They've found that the silicone treatment is easier to apply and control than clay coatings, and weighs as much as 100 pounds *less* per 1000 drums. This weight difference substantially reduces freight charges on carload shipments!

Syl-off coatings are available on most types of paper and paperboard containers and some are suitable for food products. Whether you ship, store or receive sticky materials, a silicone paper coating will benefit your company. *No. 749*

SILICONE *(Continued)*

at its test temperature of 240 C (60° over normal Class H operating temperature). Every 500 hours of the test period the motor is stopped and exposed to 100% relative humidity for 24 hours. Today, this motor is approaching 90,000 hours of service at a copper temperature of 240 C. This is equivalent to 516 years of operating time at 180 C!

This test, and countless on-the-job applications, prove that insulation systems made with Dow Corning Silicones assure long, trouble-free service in rough environments. How about *your* motors? *No. 750*

new literature and technical data on silicones

Easy To Use — Dow Corning 5 Compound curtails arcs, shorts, and the formation of leakage paths on insulators exposed to contaminated atmospheres. In addition, 5 Compound is easy to apply and reduces cleaning time and costs. It can be removed without the use of solvents or abrasives, and the time intervals between cleanings are substantially increased because of the longer-lasting protection provided by this grease-like silicone compound. An illustrated data sheet gives details. *No. 751*

A Code Is Your Key to where you can get the Silastic material you want. A recently revised list of Silastic fabricators is letter-coded to let you know at a glance which rubber companies calender, dispersion coat, extrude, mold, sponge, or make ducting, hose, o-rings, rollers, or specialty parts from Silastic. If you consider ALL the properties of a silicone rubber, you'll specify Silastic from one of these fabricators. *No. 752*

You Can Foil Foam — Dow Corning defoamers kill foam that develops in the processing of chemicals, petroleum, asphalt, paper, textiles, food and drugs. A pamphlet indicates the minute amount of silicone defoamer required to gain added working space, decrease production time and trouble in metal working and each of the above processing industries. Investigate the savings made possible with defoamers by encircling *No. 753*

Good Service That Shows — A new reprint from Products Finishing explains the maintenance and production savings silicone coatings can afford. The gloss retention and chalk resistance of silicone surface coatings are excellent . . . even when plant equipment is exposed to wide ranges of ambient temperatures over a period of years. Maintenance costs decrease, intervals between refinishings increase, and appearance is improved. This reprint contains case history illustrations and tables showing properties of several silicone coatings. Write for . . . *No. 754*

Visual Proof — The many benefits of silicone electrical insulation are shown in the sound and color movie, More Muscles for Tomorrow. A descriptive folder tells how to arrange for showings in your plant. *No. 755*

Dow Corning Corporation, Dept. 5122, Midland, Michigan
Please send me: 747 748 749 750 751 752 753 754 755

NAME _____
TITLE _____
COMPANY _____
STREET _____
CITY _____ ZONE _____ STATE _____

SILICONE NEWS is published for production and maintenance men by

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

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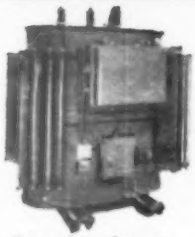
FOR DATA RELATING TO THESE ARTICLES, CIRCLE REFERENCE IN COUPON ABOVE, OR REFERENCE NUMBER ON READER SERVICE CARD

Top Quality substations...

15 kv outdoor primary unit substation styled by Raymond Loewy

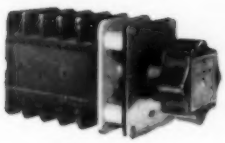
every major component manufactured by Federal Pacific



Power Transformers

Protective Relays

Indicating Instruments



Instrument Switches

Potheads

High Voltage Air Breakers

For single-source responsibility and reliable operation, look to Federal Pacific, one of only three companies to manufacture every major component of its primary unit substations. Federal Pacific's unit engineering, coordinated assembly, integrated quality control assure you built-in reliability and longer substation life. Federal Pacific Electric Company, General Offices: Newark 1, New Jersey.

FPE **FEDERAL PACIFIC ELECTRIC COMPANY**

The Best in Electrical Distribution and Control Equipment

For more facts Circle 590 on Reader Service Card

For more facts Circle 591 on Reader Service Card ➤

Westinghouse develops new motor starters with 6 "monkey proof" safety features

Westinghouse NEMA 12 Life-Line combination starters end unauthorized tampering, offer greater safety and convenience to service personnel

To order simply contact your local Westinghouse representative or distributor now, or write Westinghouse Electric Corporation, Standard Control Division, Beaver, Pa.

YOU CAN BE SURE... IF IT'S **Westinghouse**

Watch "Westinghouse Lucille Ball-Desi Arnaz Shows" CBS TV Fridays

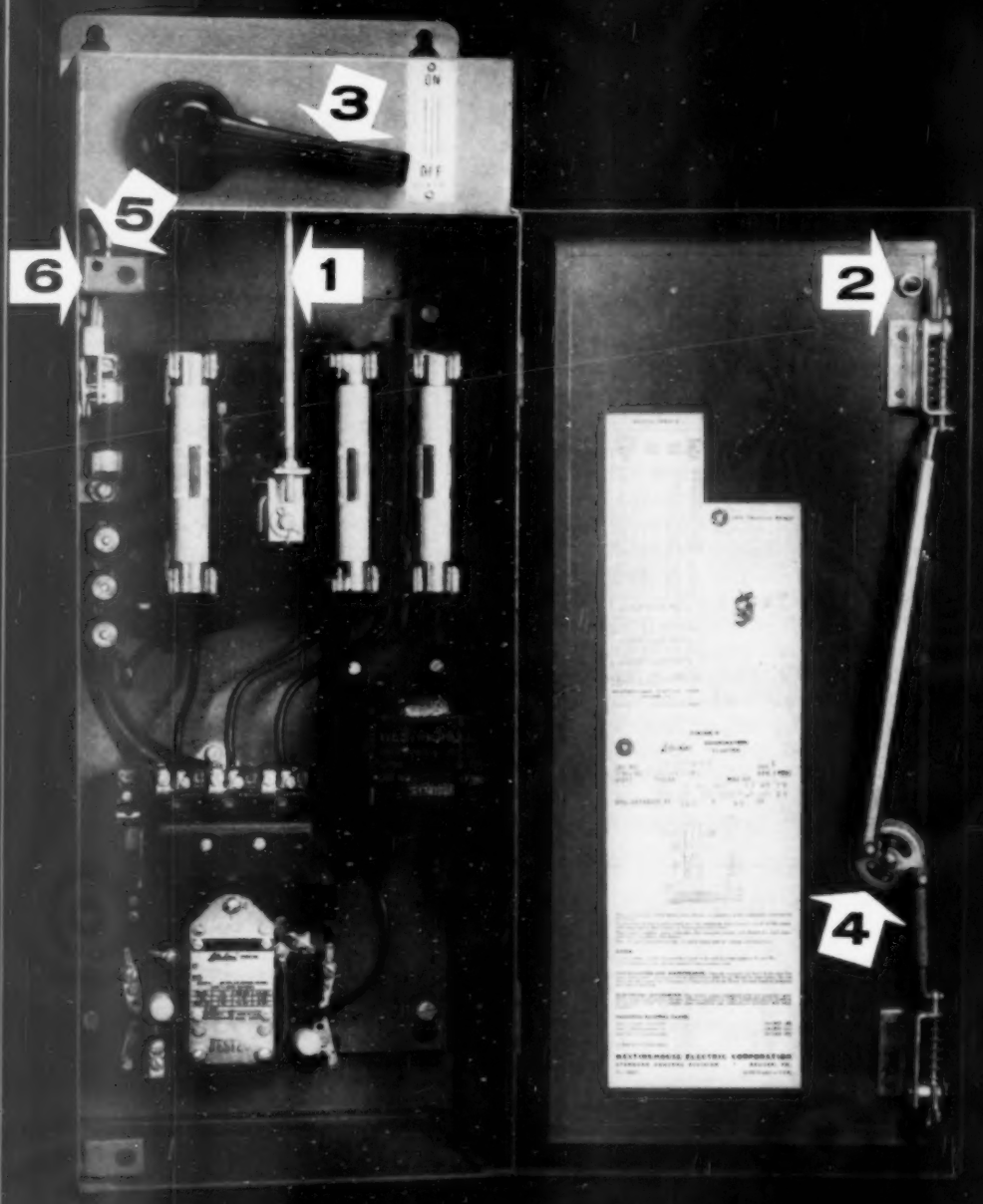
Check these 6 great new safety "firsts"...

1 2 3

SAFE—You always know whether power is on or off because ON-OFF handle is permanently attached to disconnect... even when door is open.

SAFE—Positive gasket seal keeps out oil and dust. An interlock requires that door must be tightly sealed before handle can be moved to ON position.

SAFE—Even when you're out of sight, padlocking ON-OFF handle prevents any operation of disconnect regardless of whether door is *OPEN* or *CLOSED*.



4 5 6

SAFE—Discourages tampering by unauthorized personnel. Tool required to open door.

SAFE—Accidental operation of disconnect impossible when door is open. Disconnect interlock must be deliberately voided to operate ON-OFF handle.

SAFE—Interlock prevents door from being opened when switch is on. ON-OFF handle must be in OFF position to open door.

J-30306

Bonus Values From Your Electrical Engineer

If you're using only his traditional professional services, you're not making the most of his skills and experience. Here are examples of the "extras" he can provide:

1. Layout—His ideas can save you money on distribution equipment cost—help you minimize the need for premium-priced equipment—plan your electrical system for low-cost future growth.

2. Material handling—He can advise you on controls and drives, counting and weighing systems. He'll see that electrical components can be adapted to equipment changes.

3. Communications—He can tailor high-speed intra- and interplant systems to conditions in your plant, thus avoid interference. You'll need his skill when you switch over to electronic handling of production data.

4. Training—He's indispensable in training your employees to understand today's machines.

5. Cost control—If you orient him to the management point of view, he'll see his problems in terms of dollars. He'll track down power waste—and stop it.

6. Quality control—If motor speeds, voltages, static electricity, and the like are critical in product quality, he's your man.

7. Productivity—He can tell how (and where) electrical devices can cut manpower needs—and update machines.

8. Safety—He can help you guard against hazards peculiar to your plant. He'll control static electricity hazards, advise you on electrically operated safety devices, design lighting for safety.

9. Employee morale—With his advice, you can modernize your plant so employees will be proud of it—make it well lighted, electrically efficient, safe, and tidy.

10. Consulting services—He's a power specialist. But he knows a lot more. You can use his math skill in operations research, his instrumentation know-how in vibration problems, his vision for long-range plans.

Checklist of

THE POWER SYSTEM

1. Originate or evaluate recommendations for improving adequacy, reliability, and economy in the plant power system.
2. Originate or evaluate recommendations for improving safety throughout the plant.
3. Acquire, analyze, and report power usage data.
4. Acquire, analyze, and report power-system load and short-circuit surveys.
5. Review maintenance and downtime records (with electrical maintenance) with the purpose of improving system and equipment performance and staying ahead of obsolescence.
6. Supervise technical negotiations with power company.
7. Originate or evaluate recommendations on standardization of electric equipment.
8. Supervise negotiations with outside electrical inspectors.
9. Supervise system and equipment negotiations with outside insurance personnel.

You should be cashing in on these "extras" . . . as well as these . . .

Getting the Bonus Values From

These "extras" are yours for the taking. Without them, you're missing a sure bet for lower-cost operations, higher product quality, better worker morale.

WOULD YOU invest big money in a high-speed automatic punchpress, then use it at only half capacity? No. You'd work it for all it's worth. Yet some companies invest in a plant electrical engineer (or a versatile electrical maintenance supervisor, or electrically experienced plant, process, or industrial engineer) and use only part of his capabilities. Result: only a partial return on a substantial investment.

The truth is, your plant electrical expert—whether he's a graduate electrical engineer or not—offers many a bonus value over and above his traditional, routine services and skills (panels above). It's up to management, hard pressed as it is today by costs and competition, to use all this man's skill, his experience, and his technological savvy—not just part of it.

How can you get these "extras"? First you define them—that's what this article does. Then you go after them, presenting them to your electrical expert as good opportunities for him to widen the scope, interest, and importance of his job and to work more frequently as part of plant management.

What are these "extras"? For a quick rundown, look at the left-hand panel above. For a detailed breakdown of 10 of the plant operating areas in which your electrical expert (or staff) can help you, read on.

By G. C. QUINN
Electrical Services Editor
FACTORY

PLANT LAYOUT

When you're changing plant layout or planning a new facility, you can use your plant electrical engineer two ways—the wrong way, or the right way.

Wrong way—Work out product

Traditional Duties for Your Plant Electrical Engineer

10. Supervise or coordinate special power-economy efforts.
11. Originate or coordinate recommendations for power dispatching or load dropping to cut down on demand penalities.
12. Make emergency engineering decisions during power outages.
13. Coordinate (with electrical maintenance) spare-parts requirements for electrical equipment.

POWER SYSTEM CHANGES

14. Make preliminary studies to find changes or additions that may be needed.
15. Coordinate proposed changes with the practices of the maintenance department.
16. Determine feasibility of using engineering services provided by outside contractors.
17. Evaluate outside engineering service firms.
18. Check and approve construction drawings.
19. Assign circuit codes for each part of the system.
20. Keep system maps, plot plans, and diagrams up to date.
21. Inform supervisors how changes will affect their operations.
22. Evaluate bids submitted by outside contractors.
23. Evaluate bids submitted by equipment vendors.
24. Coordinate changes with outside inspection authorities.
25. Coordinate changes with outside insurance authorities.
26. Serve as project engineer to coordinate, schedule, and inspect electrical construction work.
27. Specify (with electrical maintenance) new operating procedures.
28. Follow up and evaluate performance guarantees on new equipment.

ELECTRICAL PROJECTS

29. Originate or evaluate recommendations for changes in plant lighting levels.
30. Design and specify changes in or additions to plant lighting.
31. Originate or evaluate recommendations for changes in electric motors or drives for plant production or auxiliary equipment.
32. Approve specifications for important new power-using equipment to determine problems of power supply and control.
33. Originate or coordinate recommendations for changes in electric or electronic controls or for changes in instrumentation.
34. Design custom-built electrical equipment needed for production.
35. Plan and specify communication systems (paging, intercom, closed-circuit TV, two-way radio).
36. Supervise technical negotiations with the telephone company.
37. Plan and specify electrically operated systems for plant protection and alarm.
38. Design and specify the lightning protection system.
39. Design and specify electrolytic corrosion-prevention methods.
40. Design and specify static-electricity prevention systems.
41. Design and specify changes in the grounding system.

traditional professional services of your electrical expert.

Your Plant Electrical Engineer

flow and placement of machinery and material handling equipment. Determine operator positions. Then confront him with the job of providing power, lighting, and control.

Right way—Use his training and skills in the same way you use the skills of other plant operating and engineering aides when you plan changes or new facilities.

Here are a few of the things a good electrical engineer can do for you if you call him in while the layout is being planned—not after:

- Suggest layout changes that will bring big savings in distribution equipment cost. For example, moving your welding areas next to a load-center substation.
- Where there are hazardous atmospheres, show your layout group the advantages of separate non-hazardous areas for controls, distribution equipment, and drives. This way, you won't have to pay for explosion-proof equipment throughout.

MEMORANDUM

To: Plant electrical engineers.

From: FACTORY editors.

Subject: Why you, too, should read this article.

This article is for your boss. But it's about you. It will tell you how what you're doing stacks up against what you might be doing, thus help you make your plant better—and earn a better spot for yourself.

- Design the electrical system so you can accommodate any conceivable future change in product flow with minimum expense or change in electrical equipment.
- Design for the power continuity you need—no more, no less. Why? Because he'll know how much power continuity is worth in each part of the facility.
- Stimulate the others in the planning group to look ahead. He can tell them about process changes that electrical developments still in the laboratory stage might bring. For example: high-energy ultrasonic processing; plasma-arc heat sources; plug-in AC to DC conversion equipment; high-speed radiant heating equipment; and fast, high-power automatic control systems.

Turn the page

250,000 Power Tools per year with Cities Service Pacemaker T

Porter-Cable, one of the world's largest manufacturers of portable wood-working tools, has long known the value of quality in a lubricant as well as in a power tool. Each piece of equipment made by Porter-Cable is carefully pretested before manufacture and then continually tested for years after its original appearance on the market. It is this kind of thoroughness that led to Porter-Cable's choice of Cities Service Pacemaker 300 T as the hydraulic oil to power their Fostermatic Screw Machines and Landis Grinders.

But Cities Service Pacemaker T is more than a hydraulic oil . . . it is a multi-purpose line of lubricants suited for many applications. Porter-Cable also uses Pacemaker 300 T for lubricating valves in the plant's compressors. Pacemaker T can be used to lubricate bearings, diesel engines, electric motors, generators, reduction gear drives, turbines and in circulating systems.

Pacemaker T is available in various viscosities to give you one line of quality lubricants that can save costly warehouse space by simplifying your inventory . . . cut maintenance costs and extend equipment life. These oils have high viscosity index, excellent heat resistant properties and are chemically fortified against oxidation, corrosion, rust formation and foaming.

Contact your nearest Cities Service office and an experienced Lubrication Engineer will call to make specific recommendations for your plant on the use of Pacemaker T. Or for further information, write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

Porter-Cable Machine Company
Syracuse, New York

Porter-Cable Research Engineer testing engine for new lawnmower the company will produce soon. All new products undergo extensive research and testing before production.

Backbone of Production Line is Automatic Screw Machine. Pacemaker T gives outstanding performance as hydraulic medium in these machines as well as in Landis grinders and as a general lubricant!

For more facts Circle 592 on Reader Service Card

• Weigh and evaluate layout alternatives while they're being planned, tell you their effect on lighting requirements, electrical safety, machine operator and cotnrol coordination, and the feasibility (now or in the future) of automatic process controls or remote operation.

MATERIAL HANDLING

In many an industry and many a plant the plant electrical engineer can be a valuable consultant.

Here are a few examples of how he can help you:

• Guide you in selecting drives and control methods for cranes.

• Evaluate various types of elevator controls and drives in relation to the characteristics of your power system.

• Tell you which of a dozen different variable-speed conveyor drives will give you best over-all electrical performance to match your mechanical requirements.

• Steer you in getting adequate battery-charging facilities for electric trucks at lowest cost.

• Help you find the most dependable electronic counting or weighing systems for your needs.

• Make sure that the electrical equipment you buy for your handling system can be economically adapted as it changes or grows.

COMMUNICATIONS

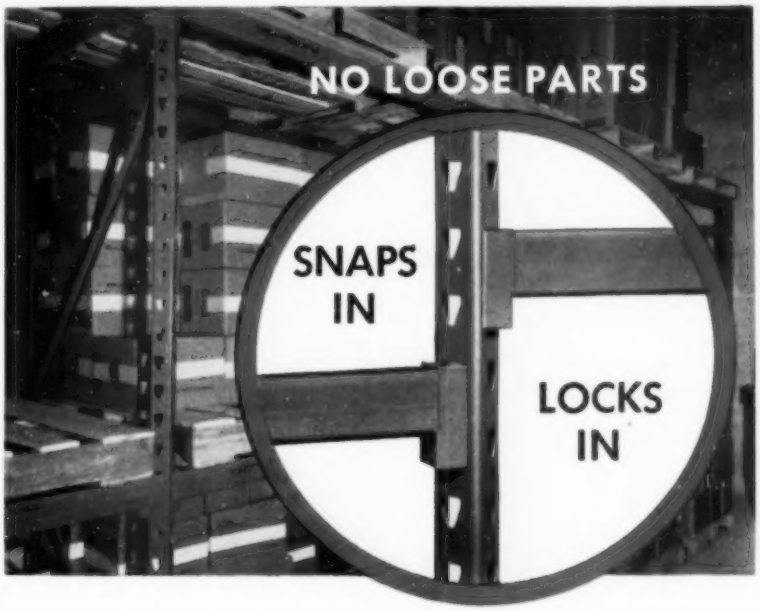
A good electrical engineer can work either side of the decimal point. That's another way of saying that he can design microwatt communication (or control) systems as well as kilowatt power systems.

With that skill, here are two big ways he can help you:

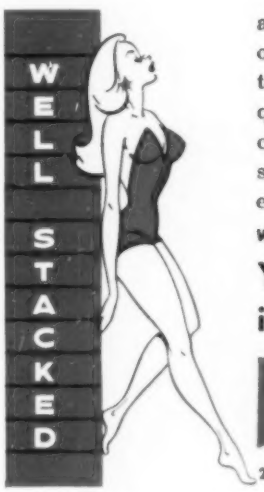
• Design microwatt and kilowatt systems so they won't interfere with each other. High-speed communication (voice or data) from one part of the plant or office to another is a "must" in many a plant today—and will be a "must" in more plants in the near future. But microwatt and kilowatt circuits can interfere with each other—and with the equipment that operates from them—unless somebody prevents it.

Turn the page

FAST!
EMI air-row head
FULLY ADJUSTABLE PALLET RACKS



★ EASY TO ERECT
★ ONLY 2 BASIC PARTS
★ SIMPLE TO ADJUST
★ QUICK TO RELOCATE



EMI AIR-ROW Head Racks easily adjust to stack pallets, skids, dies and bulk of varying heights. Upright frames are tied together with sturdy steel support beams which quickly snap into AIR-ROW slots in the vertical post. Forge lock fittings on the ends of the support beams insure positive self-locking engagement with no sway or pop-out.

WRITE FOR OUR COMPLETE CATALOG!

You can stack or ship ANYTHING in any industry on EMI racks

EQUIPMENT MFG. INC.
21561 HOOVER ROAD • DETROIT 5, MICHIGAN

For more facts Circle 593 on Reader Service Card

Model 210 A-W hydraulic cranes speed erection of building at Columbus (Nebr.) plant of Behlen Mfg. Co., manufacturer of Behlen Frameless metal buildings and agricultural equipment.

Materials handling manager says:

"...Haven't considered any other type of handling equipment since first A-W crane!"

Behlen Mfg. Co., Columbus, Nebr., owns three model 210 Austin-Western self-propelled cranes. Materials handling manager Howard Brunken says, "The Austin-Western hydraulic cranes are great improvements over our previous materials handling equipment.

Well satisfied

"We bought them because of their versatility and ability to maneuver into tight corners with all-wheel steering. We're well satisfied with their superior performance.

"The 18-ft. telescoping booms, which rotate in full circles, are important features for both inside and outside operations. Hydraulic controls, all-wheel drive and steering make the crane easy to operate with precision.

"We use the Austin-Westerns to handle all heavy, cumbersome loads. It seems that every day we do something unusual with our cranes because of their great versatility. Since using the first one, we have not considered any other type of handling equipment!"

Three models available

A-W hydraulic cranes are now available in three models—the 210 self-propelled rubber-tired unit; the 210-P for special truck or stationary mounting; and the 220 with counterweighted boom for greater lifting capacity. Choice of gas or diesel power . . . wide range of optional attachments.

Learn how Austin-Western hydraulic cranes can add profits by safely speeding your materials handling. Investigate! See your nearby A-W distributor now or write to us today for full information.

Austin 100th YEAR **Western**

CONSTRUCTION EQUIPMENT DIVISION, AURORA, ILL.

BALDWIN · LIMA · HAMILTON

BALDWIN BLH LIMA-HAMILTON

Power graders • Motor sweepers • Road rollers • Hydraulic cranes

ELECTRICAL ENGINEERING

Begins on page 230

Here's where your electrical engineer plays a star role. He'll do something that you can't expect outside vendors to do. That is, foresee all the possibilities for interference in paging, intercom, P-A-X, closed-circuit TV, centralized production control, alarm, protection, and remote control systems.

Fact is, there are countless industrial intercom systems that are used only seldom—if at all—because nobody knew how to specify installation in those particular plants. The cause: Interference from other plant circuits or high ambient noise levels limit the operation of these systems. Finding your way through the woods when specifying industrial two-way radio, for example, is no job for anybody but an electrical expert. An electrical engineer who knows the field (FACTORY, September 1959, page 272) might cut your two-way radio costs by more than half.

• Help plan your data handling systems. Electrical and electronic systems, that is. They're fast catching on in the manufacturing industries. They're bringing a vast improvement in management control over all phases of production—not to mention personnel, sales, and finance. Much of this equipment is available now. But somebody has to integrate the various systems carefully into the needs of the plant. Your electrical engineer can be the most valuable man on your team.

TRAINING

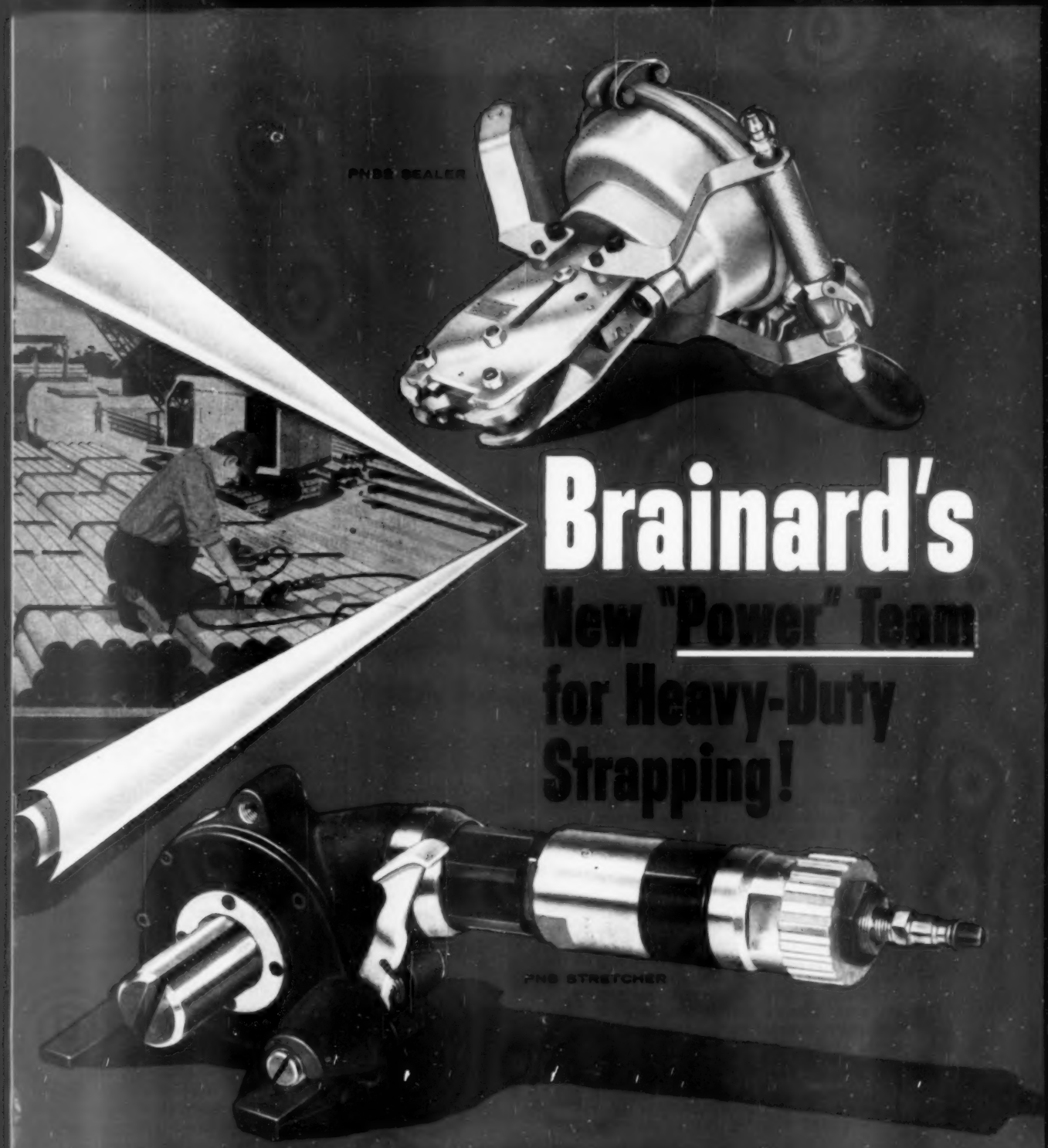
If you're in an industry whose production methods and machines are changing rapidly, take a quick review of your power bills for the past several years. They'll convince you that production today depends far more on electric power than it used to. A big share of your production employees (and their supervisors) are directly involved in running electrically operated equipment. And every new type of electrical equipment brings some new problem in training.

In these training needs your electrical engineer can be a great help. Here's how:

• Conduct (or plan) classes for

For more facts Circle 594 on Reader Service Card

For more facts Circle 595 on Reader Service Card ➤



Brainard's New "Power" Team for Heavy-Duty Strapping!

Two more new heavy-duty power tools added to Brainard's rapidly growing strapping system—the exclusive PNB stretcher and the PNB2 sealer—give even more cost-cutting advantages to heavy-duty strapping users everywhere.

The PNB pneumatic stretcher permits quick tensioning—automatically—and maintains it. Then the PNB2 pneumatic sealer, with a simple press of the thumb, gives a strong, safe, lasting seal.

Both tools working as a team assure you of fast, efficient heavy-duty strapping on 2" x .050 size on many types of carloading and packaging. Particularly adaptable to carloading of pipe as illustrated.

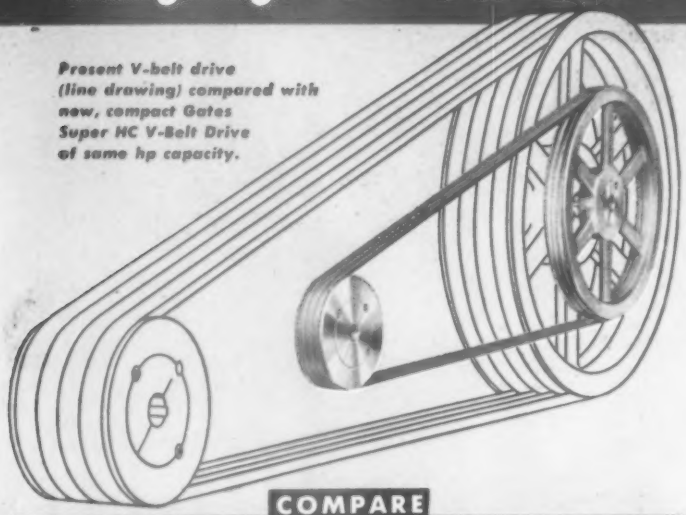
Why continue with obsolete, time-consuming equipment? Get in touch with your Brainard representative for details and prices.

BRAINARD Safe-Ty **STRAPPING**

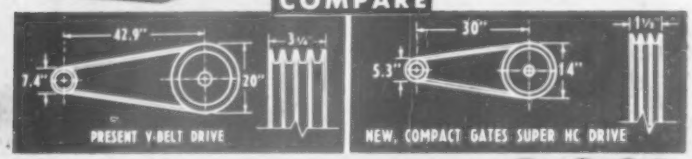
DIVISION OF SHARON STEEL CORP. • WARREN, OHIO

Designing NEW DRIVES?

Present V-belt drive (line drawing) compared with new, compact Gates Super HC V-Belt Drive of same hp capacity.



COMPARE



Save up to 20%

with new high capacity V-belt drive

When you change the whole drive — both V-belts and sheaves — remember: The cost of a Gates Super HC V-Belt Drive is as much as 20% less than the cost of present V-belt drives of the same horsepower capacity.

A development of Specialized Research in the world's largest V-belt laboratories at Gates, the new Super HC V-Belt makes possible the most compact, lightest-weight, lowest-cost multiple V-belt drive you can put on any machine!

Cuts drive space as much as 50%

With Gates new Super HC V-Belt, sheave diameters and widths can be reduced 30% to 50%, center distances 20% and more. Bearing load is lightened and total space occupied by the drive may be cut as much as 50%.

"The Modern Way to Design Multiple V-Belt Drives" is an informative handbook on the Super HC Drive, available from your nearby Gates Distributor listed in the Yellow Pages of your phone book.

The Gates Rubber Co., Denver, Colorado
Gates Rubber of Canada Ltd., Brantford, Ont.
World's Largest Maker of V-Belts

TPA 439

Gates SUPER HC V-BELT Drives

employees on electrical theory and the effect of improper operation on the plant's electrical system.

- Help conduct routine refresher courses in electricity.
- Train electrical and other maintenance men in advanced electrical matters—static switching and numerical controls, for example.
- Evaluate prospective electrical maintenance employees—and prospective plant engineering employees who may be involved in electrical work.
- Provide advice in the study of employee accidents involving electricity so that changes may be made to prevent recurrence.

COST CONTROL

Your plant electrical engineer can give plenty of help in cost control. But he'll do only half as well as he can unless his goals are the same as those of operating management. If he doesn't have this identification with management, he will see his problems as engineering projects—not as a part of the larger problem of running the plant profitably.

So if you expect him just to keep the power system free of trouble, that's just what you're likely to get—and nothing more. One or two unavoidable failures, followed by the inevitable criticism—and he'll be specifying everything super-safe and super-deluxe. But few plants can afford such gold-plated electrical layouts. And no management-oriented electrical engineer will specify them. To keep your electrical engineer management-minded, be sure he serves on the management committees where his know-how is valuable. This way, he won't spend a dime that can't be translated into some benefit to the plant's owners, employees, or customers. And he'll give support to cost control in many specific ways. Here, for example, are two:

- Track down power waste—and put a stop to it. A management-minded electrical engineer thinks of kilowatt-hours, used and wasted, the same way an accountant thinks of dollars. He can find out, faster than anybody else, where power is being wasted. And he knows how to stop

such waste. He knows the difference, for example, between occasional campaigns to turn off lights and curbing really big power-wasting practices.

• Help you plan new loads—or change the timing of your present loads—in such ways as to justify better rates from the utility.

QUALITY CONTROL

Top quality and electrical know-how are closely related. For instance, slight changes in motor speeds can seriously affect finishes on metal, wood, or plastic surfaces produced by grinding, turning, or milling. Sometimes the problem is to recognize such troubles as electrical problems. Other times, the problem is to find the right answer. In both ways, and in other ways as well, your electrical engineer can help you. He can . . .

• Tell you when your problems are electrical.

• Guide you to the right solution. His solutions may range all the way from running a separate line for a cutting-tool motor to installing variable-speed synchronous motors and a supporting generator system with feedback control. But whatever his solution is, it will be a good one.

• Supplement the mechanical know-how in your organization with electrical know-how, thus provide assurance that you're getting just what you need from vendors.

• Keep your product-finishing department competitive and technologically up-to-date. For instance, if your infrared drying facility is poorly designed—that is, if voltage, heat source, or heating-cycle characteristics are wrong—you may be wasting up to half of the power supplied. If that's true, you're paying more than you should be paying. Or your electroplating processes and equipment may be lagging behind today's improvements in control methods and power-supply efficiencies. If so, you're not getting the quality you need to stay competitive. Where power-using equipment is involved in modernizing and in staying competitive, your electrical engineer can be your right arm.

Turn the page

Improved Gates Vulco Rope gives you 2 important advantages

1. 40% higher hp rating at no increase in price: This important cost-saving advance is the result of Specialized Research in the world's largest belt-testing laboratories at Gates. **As replacements on standard drives these V-belts with 40% more load-carrying ability give longer service life...reduce down-time, cut belt replacement costs.**

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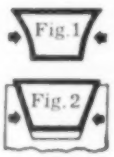

Available in all sizes from your nearby Gates V-Belt Distributor listed in the Yellow Pages of your phone book.

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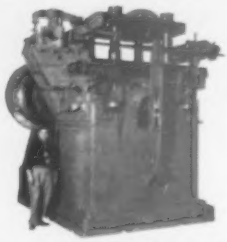

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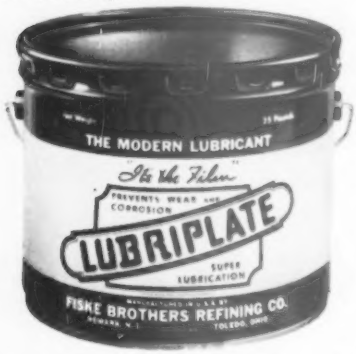

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ELECTRICAL ENGINEERING

Begins on page 230

• Design or modify production equipment to eliminate static electricity—or to minimize its effect on product quality. Why design it? Because much of the needed equipment isn't commercially available—it has to be custom-built.

PRODUCTIVITY

An alert plant electrical engineer knows about new electric and electronic control and labor-saving devices. He's equipped to give strong support to every productivity-improvement effort in your plant. Here are just a few examples of ways he can help you. He can . . .

• Spot the places where automatic timers or programing devices will cut labor requirements.

• Find strategic central points from which scattered operations can be controlled automatically or manually—and efficiently.

• Evaluate or recommend remote or automatic controls on the basis of cost, reliability, availability, and suitability to the process.

• Adapt new control systems to machine tools that need updating. To your electrical engineer, a problem in automatic sequence control, which might cut labor costs in half, is just another job of picking the right relays, timers, and synchros and having them assembled.

• Keep you abreast of latest component developments. This way, as soon as new components are available (like cheaper high power transistors, industrial rated positioning devices, or magnetic amplifiers, for example) you can put them to work. You won't have to wait until some manufacturer markets a new system that's more flexible (and expensive) than you need.

• Back up other engineering talent and release it for wider, more creative duties. With an electrical engineer in the plant, other engineers won't be hamstrung by their own electrical limitations. They can reach out for equipment and process advancements, confident that their own skills and those of the electrical engineer will find the best of what's new—and make it work.

Turn the page

swallows noise

This is an Eckoustic Panel — a very special sandwich, made of two layers of steel wrapped around a blanket of Fiberglas.

You can use it as a modular building block to build a soundproof room or plant office — a machinery enclosure — a production test facility — or, for that matter, practically anything where you must shut noise out, or seal it in.

Eckoustic panels protect employees from the harmful effects of exposure to continual noise . . . increase employee efficiency by creating more comfortable working conditions. And we have the results of acoustical studies which show they do it more effectively than other types of acoustical panels.

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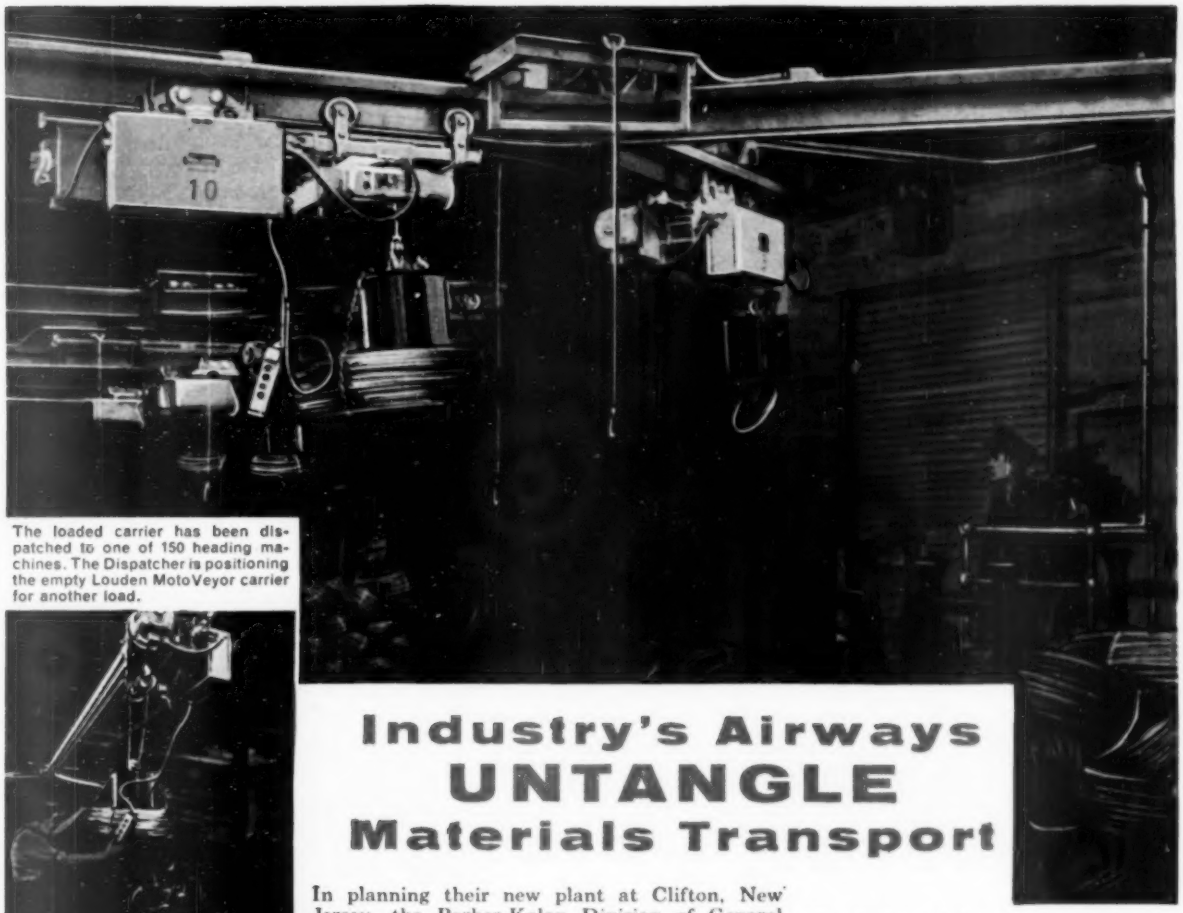
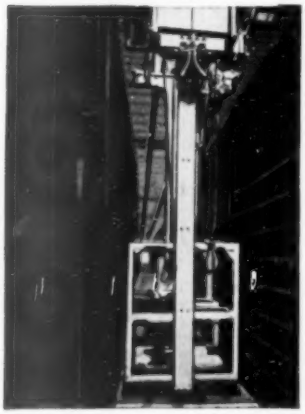


The loaded carrier has been dispatched to one of 150 heading machines. The Dispatcher is positioning the empty Louden MotoVeyor carrier for another load.

The carrier automatically stops at a selected heading machine, and operator lowers the coil of wire to heading machine reel. After hoist is raised, carrier automatically returns to Dispatch Area. Louden Shok-Pruf Electrification is used throughout.



Two Louden Tiering Trolleys serve each pan storage aisle. View shows Tiering Trolley Operator removing tote pan from storage for transfer to another department. The platform of the motor driven Tiering Trolley raises and lowers enabling the operator full coverage of the storage aisle. Current supplied by Shok-Pruf Electrification.

Industry's Airways UNTANGLE Materials Transport

In planning their new plant at Clifton, New Jersey, the Parker-Kalon Division of General American Transportation Company, manufacturers of self-tapping screws and metal specialties, "took to the air" to end longstanding problems and needless costs in materials handling. Working with Louden engineers, they took advantage of the opportunities offered by monorail overhead handling to coordinate materials supply and manufacturing needs from receiving of raw stock to the shipping of the finished product.

Typical of the improvements made was the handling of stock in the Heading Room. In previous practice, 450 pound rolls of wire were carried by fork truck, one roll at a time, and stacked at one end of the department. When any machine needed wire, the machine operator had to roll a bundle from the supply to the machine, lift it manually and place it on the empty reel. Now Louden equipment ends all this waste of time and the ever present chance of physical injury. Louden handling delivers the stock wherever needed easily, swiftly and safely.

When you have a materials handling problem or plant problem involving lifting and transporting loads, call on Louden for suggestions. Louden's unparalleled experience and proven engineering leadership combined with Louden's broad line of equipment can save time and mistakes. Write or wire today.

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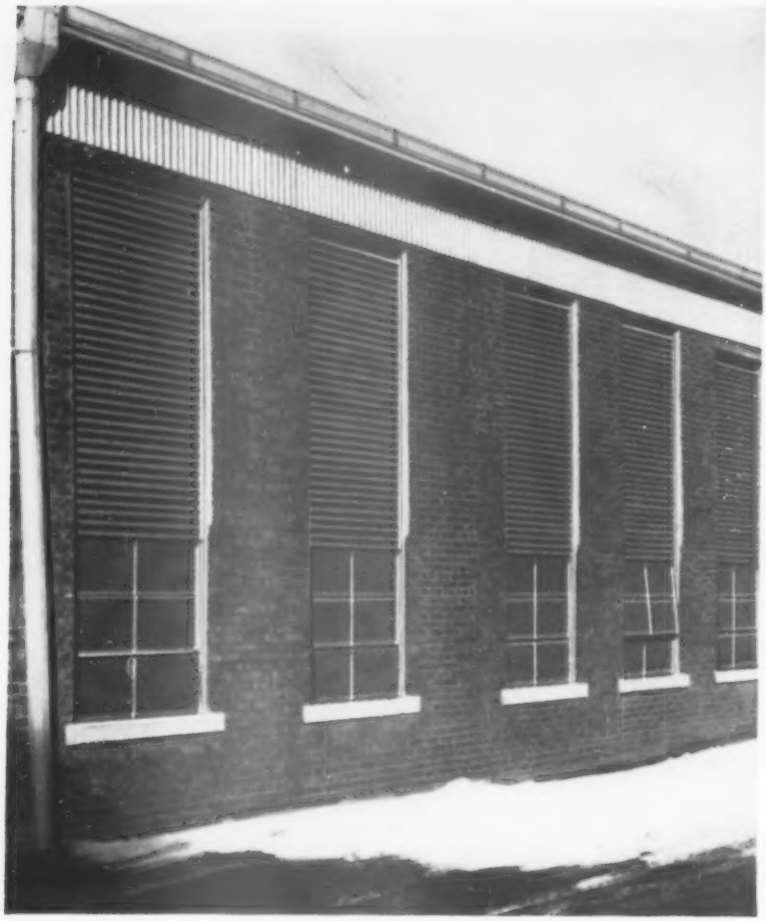

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What about your plant? You can let in plenty of free natural daylight and end broken windows, too. Glaze *once and for all* with Structoglas.

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SAFETY

You can't count on the National Electrical Code alone to keep your employees safe. Rules for high-voltage installations, for instance, are pretty general. Suppose your contractor doesn't foresee the need for mechanical protection of conductors at a remote location inside the plant. And suppose some day a worker, absentmindedly carrying a long piece of pipe vertically, bangs into one of those conductors. Or suppose that haphazard system growth has left sneak circuits where a momentary fatal voltage can develop between two adjacent grounded conduits—before the fuse blows or the breaker opens. In either of these circumstances you—and a worker—can be in very serious trouble even though no obvious violation of the code is involved in the accident.

You can avoid these kinds of trouble if you make the most of your electrical engineer. He knows your plant and is on guard against such hazards. This sort of help leads the list below. The list should remind you that he can . . .

- Eliminate freak electrical accidents, like the two mentioned above.
- Eliminate (or minimize the effects of) static electricity. This is one of the worst causes of fire and explosion in plants and plant areas where flammables are handled. If you have such a plant (or plant area), you can't wait for static electricity to show up—and then eliminate it. You've got to forestall it. Don't put the whole responsibility on your safety director. He needs the help of your electrical engineer (and the electrical maintenance supervisor, too) in checking procedures and studying changes in layout or operation that may result in static electricity.
- Suggest and evaluate safety devices. Most of the devices that protect workers on punchpresses, automatic doors, big shears, and the like are electrically operated. They often need more protection than comes with the original equipment. Sometimes, too, conditions in a given plant make extra precautions necessary. And sometimes the standard devices can be easily "fixed" by

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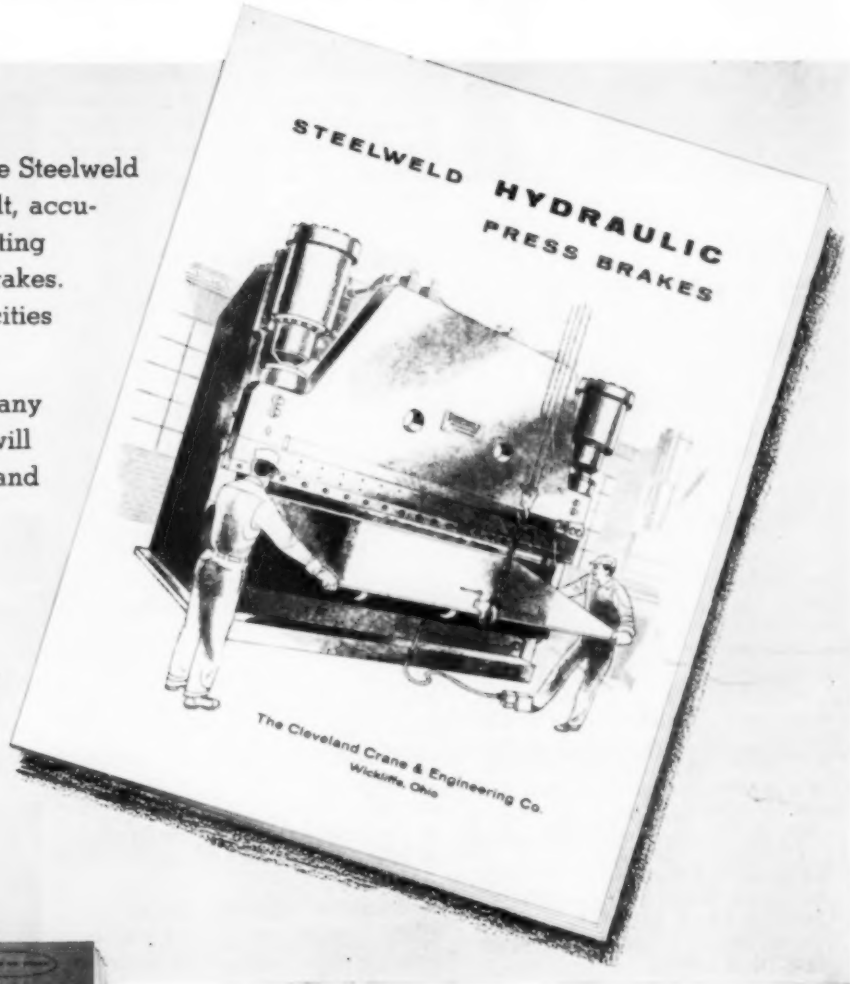

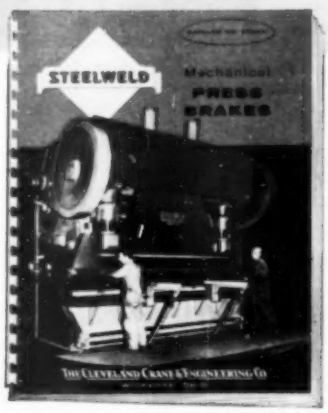

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F-109

workers who are more interested in piecework bonus than their own safety. These problems are a cinch when your electrical engineer works with your other engineers to redesign safety devices so they're really foolproof.

• Make lighting an aid to safety. Bad lighting is an enemy of plant safety. It includes inadequate lighting, glare, reflections, and extreme variations in intensity. When a plant electrical engineer is responsible for lighting design, bad lighting just doesn't happen.

WORKER MORALE

You can't hide poor electrical design. It shows up in poor lighting, outages, burned-out motors and machine downtime, slow cranes and elevators, long extension cords, and lack of power to supply added equipment. This kind of failure by management to keep the plant up-to-date is clear to everybody from machine operators to visiting customers. It hurts morale. The cure: Add an electrical engineer to the staff, give him an adequate budget for long-range electrical modernization, let him start in on the worst places first.

Low-grade electrical management hits employees hardest in two areas —safety and lighting. Your electrical engineer can give you these specific helps:

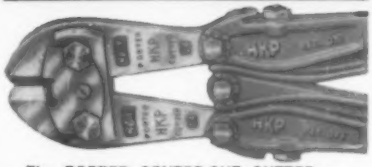
• Find and correct flaws in lighting before employees complain or file grievances.

• Determine lighting levels for every type of seeing task on the basis of sound engineering economics, rather than the whims, enthusiasms, or tightfistedness of individual departmental supervisors.

• Evaluate new developments in lighting research, equipment, lamps, and accessories. This will insure you against relighting an area, then finding that your new system is obsolete because the contractor didn't know what's newest.

• Probe your lighting problems scientifically. Your employees are now used to today's superb lighting in new homes, supermarkets, banks, and restaurants. Wanting nothing less at their work place, they may

THERE'S A



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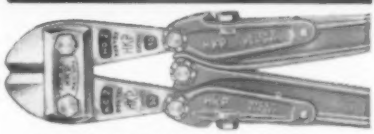

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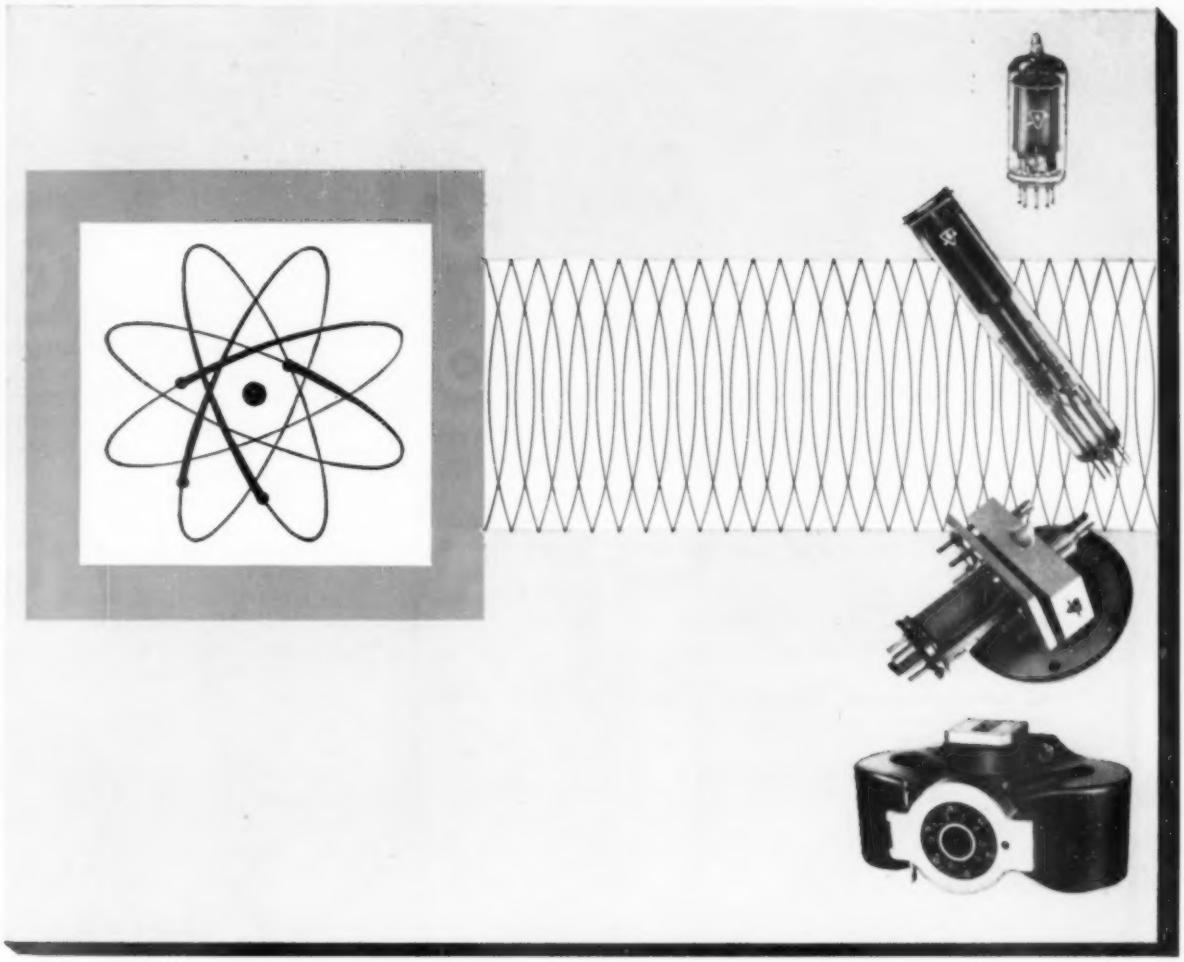

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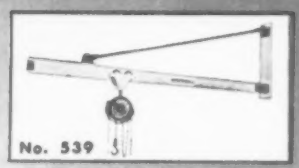

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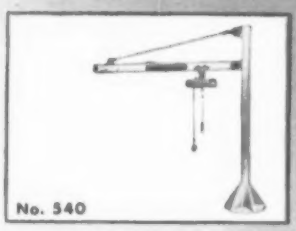
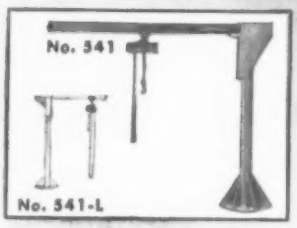
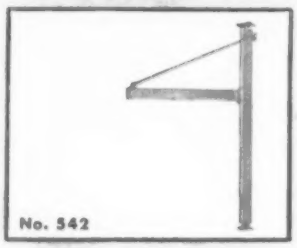


No. 541—Self-Supporting Jib Crane with Complete 360° Rotation. Outstanding features include machined steel bearing band welded to column to assure concentricity, four load carrying rollers with needle bearings mounted in head in machined cast steel trunnions; precision thrust bearing mounted in top of column to carry vertical load; two adjusting screws for leveling boom. May be equipped with collector rings for power supply for continuous rotation. Capacities to 10,000 lbs. Spans to 20 ft.

No. 541-L—New Light Duty Free-Standing Jib Crane with 360° Rotation equipped with full floating roller bearings. Ideal for mounting on machine tools. Capacities 250 lbs. and 500 lbs. Spans 6 ft. to 16 ft.



No. 542—Mast Type Jib Crane with 180° Rotation; top and bottom supports. Bronze top bearing and tapered precision roller bottom bearing insure easy positioning without drifting. Capacities to 6000 lbs. Spans to 20 ft.



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complain. Who will evaluate these complaints? Your electrical engineer should help, of course. He can update you on findings about basic lighting needs and the effect of glare and brightness on worker accuracy, productivity, and fatigue.

SPECIAL PROBLEMS

Training and temperament equip the electrical engineer to provide special help on some special management projects. What's more, he's often available for special projects because his workload, on a year-round basis, is uneven. Here are some of the out-of-the-ordinary ways he can help you:

- Turn his mathematical skills to use in operations research studies.
- Put his basic knowledge to work on noise analysis and reduction.
- Apply his familiarity with instrumentation to sophisticated projects like radioisotope uses and vibration analysis.
- Use his knowledge of rapid advancements in his field to help you in long-range planning, where vision and imagination count heavily toward success.
- Help you plan for the growth that's sure to come and advise you on new and better ways to use electric power profitably.
- Complement the other engineering skills on your staff.

FITTING THE EXPERT IN

In some plants it makes sense for electrical maintenance to report to the electrical engineer. In others, it doesn't.

Good electrical maintenance supervision involves the skill and confidence to work "hot" circuits safely and the ability to teach others to do so. It requires a willingness to work long hours—nights, week-ends, and during emergencies or changeovers—and an ability to lead and handle craftsmen—some trained, some half-trained. Men with these abilities, plus competence in engineering design, administrative talent, and willingness to act as part-time staff consultant, are hard to find. So you have to consider both the men and the job when you set up your organi-

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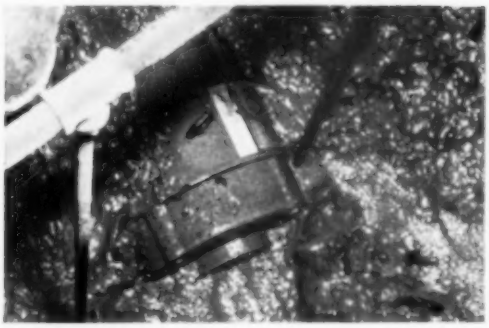

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zation chart and establish the relationship between your electrical engineer and electrical maintenance supervision.

More important than who works for whom is the close coordination of both functions—electrical engineering and electrical maintenance. It's your best way of being sure that you don't buy equipment you can't maintain economically and that maintenance shortcomings don't cancel out the advantages of good design in equipment and system.

Fact is, you need the best electrical maintenance supervision you can get. If you can't justify a plant electrical engineer economically, check and see how many of the "extras" above your electrical maintenance supervisor can provide.

Figuring the value of your electrical engineer—How you do it depends on how much you figure power is worth to you. Here's a quick way to get an answer for your own plant:

In simplest terms, your annual cost for electric power and equipment is the sum of the following items:

1. Annual interest and depreciation on your power and lighting systems. A reasonable figure is 10% of original value (20-year amortization and 5% interest). Power and lighting systems usually average 5 to 20% of the value of the entire plant, excluding production equipment.
2. Annual interest and depreciation on motors, controls, electric ovens, heaters, and other electrical production equipment. A typical estimating figure is 15% of their original value.
3. Annual average electrical maintenance costs, including supervision, replacement parts, and burden.
4. Average annual costs for electrical consulting, engineering, and new construction work.
5. Total annual cost of production downtime due to in-plant power failures.
6. Average annual power bill.

A good plant electrical engineer should be able to save you at least 5 to 10% of the total—depending on his experience and initiative and on the support you give him. Of course,

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Provide one strong joint . . . easy to install . . . terrific holding power . . . designed for minimum flexing of V-Belt traveling around sheave.

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The Modern Liquid Method that Cleans Glass or Plastic at Lower Cost per Cleaning.
The K-Lens-M Goggle Cleaning Station cuts down maintenance time for refilling; holds 1400 K-Lens-M lens tissues; dispensing one sheet at a time; holds full 16 oz. bottle of K-Lens-M lens cleaner.
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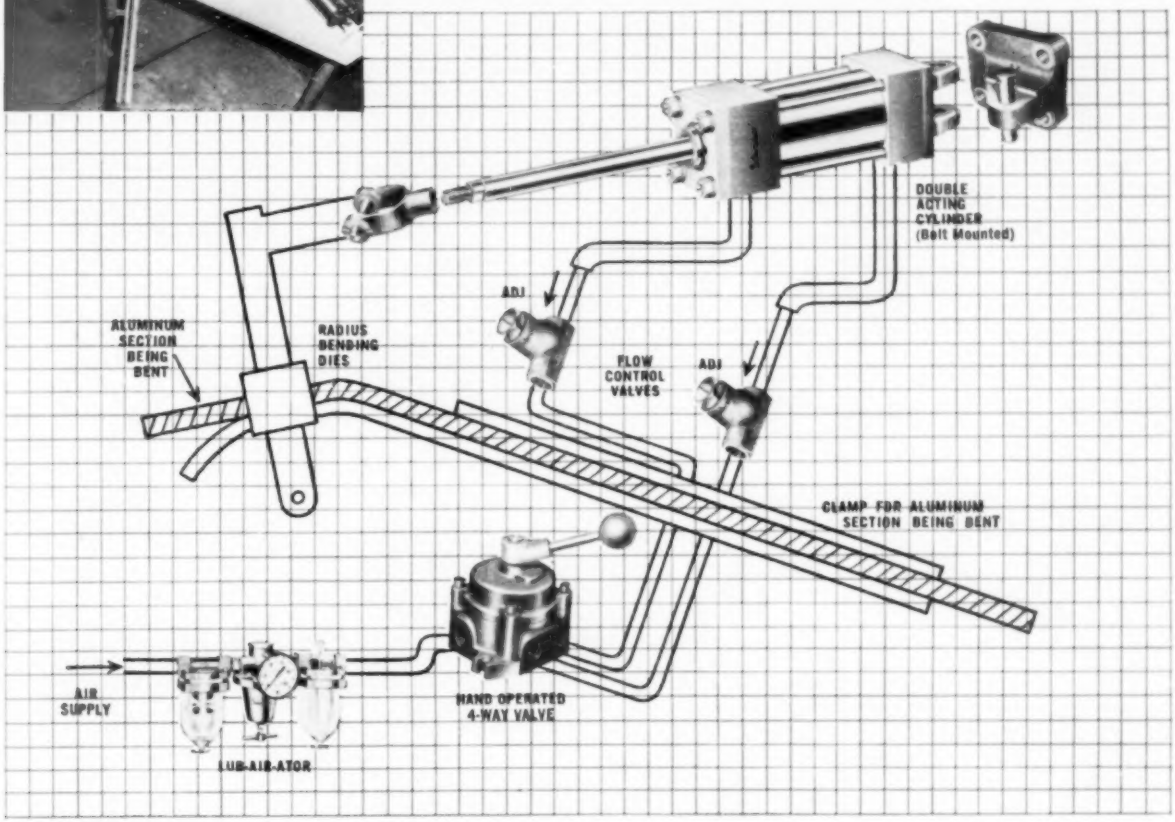
A typical example of how fabricators use Schrader. Schrader Air Products in the schematic perform a metal-forming operation at Lance Awning Corporation, Lake Worth, Florida. Power is supplied by a Schrader double-acting bolt-mounted air cylinder. By pressing the Schrader 4-way valve, the cylinder piston advances at proper speed, checked by Schrader flow control valves, bending an aluminum section to the desired angle. Reversal of the 4-way valve returns the cylinder and bending dies to rest, permitting removal of the bend section. "Air control provides a straightforward one-man job," says the Plant Manager. "Two men worked hard to form this radius bend on 25 parts per hour before a Schrader Air Cylinder was installed. Now one man forms 35."



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Air can save manhours . . . slash operating costs . . . upgrade practically any operation such as inspecting, assembling, testing and packaging. It can push, pull, hold, position and move work repetitively . . . make light of weight-lifting . . . accelerate production . . . unplug bottlenecks . . . all at unmatched low cost and drop-in-the-bucket maintenance.

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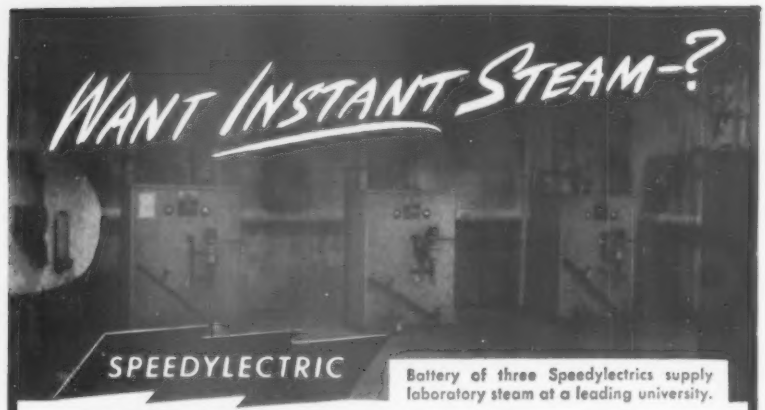

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Begins on page 230

you must evaluate the competence you already have in electrical maintenance supervision, the quality of the help you get from electrical contractors, and the electrical experience in your plant engineering and industrial engineering staffs. That evaluation will determine whether you shade your estimated savings to the high or the low side of the 5 to 10% range. If the savings won't pay an electrical engineer's salary plus overhead, you'll be better off to rely on outside help.

What an electrical engineer costs—If you drop out the aircraft and instrument industries, you'll find median salaries for engineers who are five years past graduation are about $7000 throughout the manufacturing industries. So says the latest survey by the Engineers Joint Council. This figure covers all types of engineering jobs—design, operating, test, administrative, and the like.

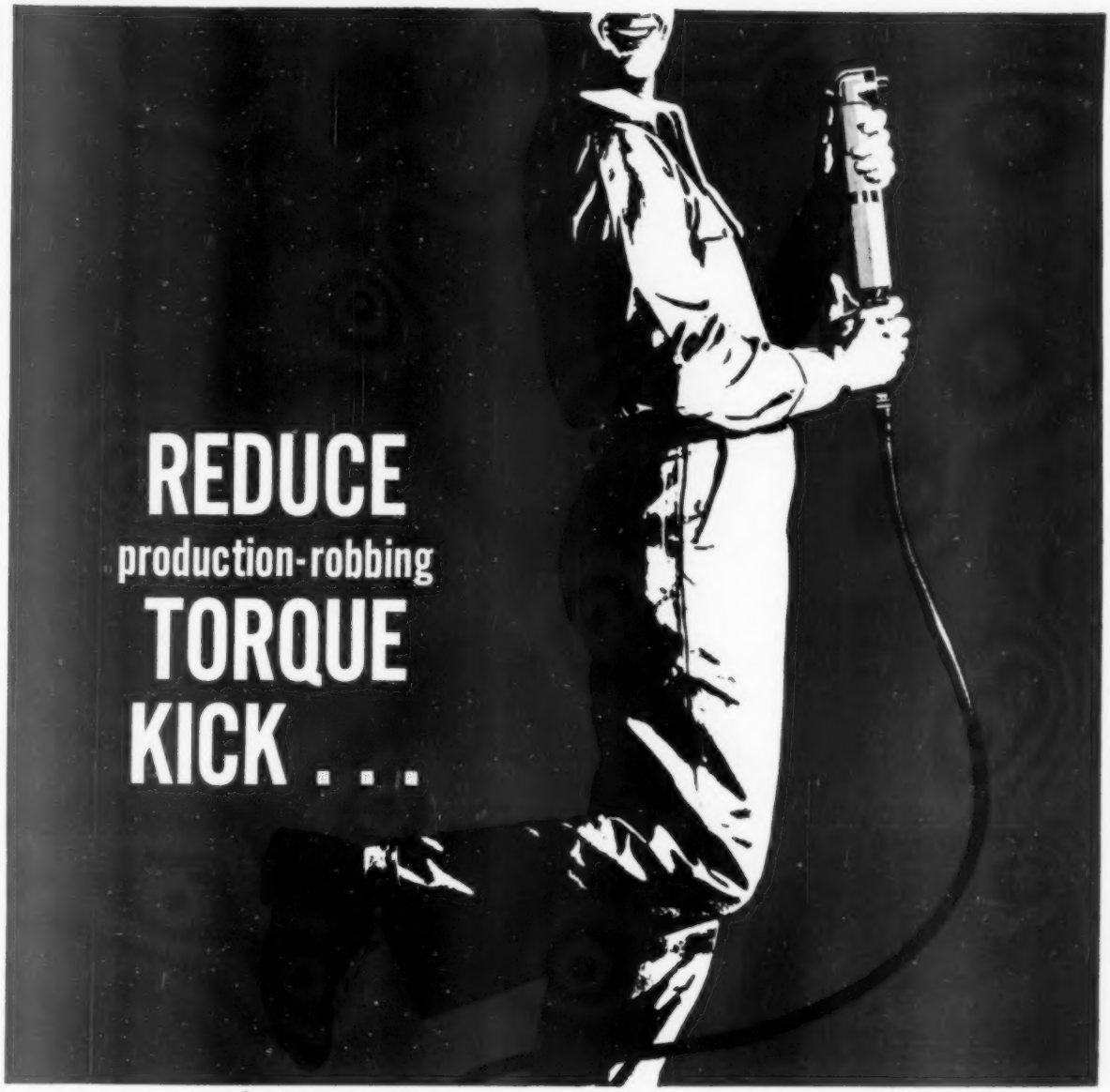
Biggest employers of the man you're looking for are the defense industries. Their biggest attractions for him are a high starting salary and an opportunity to put research findings to immediate use. But there's also disillusionment in such jobs—and plenty of job switching as a consequence. So it may not be as hard as you think to find the man you need.

Best place for you to find a ready-made power system engineer is from a utility. But they're having more trouble than others in hiring and keeping electrical engineers.

In the face of this shortage, how can you get an electrical engineer? And how can you keep him?

Best way is to analyze your advantages and tell him about them. Fact is, the range of duties and opportunities, as outlined in this article, can seldom be matched in most design, test, or sales engineering jobs. You can offer far more long-range job variety, challenge, and security. You can offer more opportunities for advancement into staff, production, and management positions. You can offer freedom from overnight technological unemployment. You can offer a chance to develop experience that will be valuable throughout industry—not just in some highly specialized area.

For more facts Circle 613 on Reader Service Card



. . . with a Cleco automatic shutoff 14 series right angle nutsetter

Cleco's 14 Series Right Angle Nutsetter can help perk up your production without extra effort from your operators. Here's how: The Cleco 14 ARA Nutsetter contains a dependable shutoff mechanism which stops the air motor instantly when preset torque is attained. And, torque reaction is substantially reduced, thereby decreasing hazardous, tiring tool kick.

This high-production nutsetter is economical, too. A new friction-free clutch permits extremely long periods of operation with negligible clutch wear. The clutch also provides superior torque control. An easily adjusted, no-drift locking device positively maintains torque that is preset to your specifications.

These attractive features make the Cleco 14 ARA an even better buy: Rugged, but weighs less than five pounds. Converts easily to a two-way tool—double-end spindles available at no extra cost permit the removal of nuts by simply revolving the spindle 180 degrees.

Call *your Cleco representative and find out for yourself what a Cleco 14 Series Right Angle Nutsetter can do for your production output.*

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For more facts Circle 614 on Reader Service Card

MATERIALS NEWS

For more about these items, circle numbers on Reader Service Card next to back cover.

Do-It-Yourself Patch Material

Armorline is a highly abrasive-resistant, adhesive rubber sheeting. It can be applied to metal, concrete, wood, and other materials almost as easily as a cold-patch was put on old-fashioned inner tubes. A thin gage of tacky rubber is bonded to the bottom side of the material.

Neither expensive tools nor special skills are needed for covering or patching equipment in the field. It is recommended for use as a protective coating against abrasion on chutes, launders, conveyors, and hoppers. Abrasive particles bounce off the exceptionally soft material, do not cut into it. Comes in 50- and 75-ft. rolls, 48 in. in width. *B. F. Goodrich Industrial Products Co.* (Circle 251).

Spun Wool Insulations Fit Many Uses

Whether it involves high-temperature industrial equipment or refrigeration systems, B-E-H Spun Felts can handle the insulation. Densities range from 3 to 8 lb. per cu. ft. Lower density materials are flexible, higher are semi-rigid.

Made of spun mineral fibers with a phenolic binder, the materials insulate surfaces at below zero to over 450 F. Lightweight and resilient, they're incombustible, noncorrosive, moisture-resistant. Easy to cut and fit with knife or saw. Coatings include kraft paper or aluminum foil combinations. *Baldwin-Ehret-Hill, Inc.* (Circle 252).

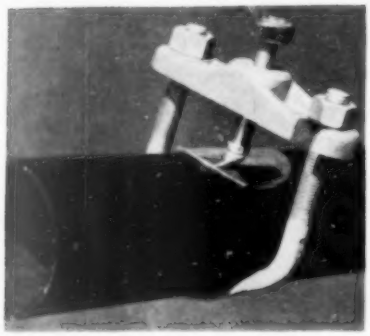
253—Joint Compound and sealant doesn't melt or flow no matter how hot it gets. Cualaid will not liquefy even when exposed to flame. Completely seals moisture out, thus offering protection under all conditions. Non-staining and non-poisonous. *Penn-Union Electric Corp.*

254—Wire Insulation called Hyrad-FR retains electrical properties of polyethylene but offers improved heat stability and cold flow resistance. Withstands soldering. Flame-retardant features make it ideal where flame exposure is important. *Sequoia Wire & Cable Co.*

255—Moisture Inhibitor absorbs and keeps dampness out of electrical equipment. CRC eliminates effect of wicking, reduces electrical failures. This liquid chemical helps recondition equipment that has been totally submerged. *Corrosion Reaction Consultants, Inc.*

New Roof Deck

Easy to erect, low cost, minimum labor force. That's what this roof deck built with Tectum building panels and lightweight sub-purlins offers. Panels fit together tightly with T-clips that slide into slotted top of sub-purlins. With sub-purlins on 36-in. centers, uplift resistance of 60 lb. per sq. ft. meets hurricane area requirements. *Tectum Corp.* (Circle 256).



257—Pipe Patches stop leaks without shutting down lines. Just put the steel patch with its neoprene rubber gasket over leak and clamp in place with special tool. Weld patch on pipe for permanent repair or leave tool in place temporarily. *M. J. Crose Mfg. Co., Inc.*

258—Traffic Markers of extruded vinyl strip are for outlining plant traffic areas and parking lots. Adhesive on back of the weather-proof reflectorized material bonds permanently to surface area to be marked. Comes in colors; 3, 4, and 6 in. wide. *Auburn Plastics, Inc.*

259—Construction Angles feature "erector-set" flexibility, and are strong, re-usable. Grey-enameled steel angles have recurring crescent-shaped and oblong slots, plus holes for easy assembly with rustproof bolts. In several sizes, with accessories. *Jaton Products Corp.*

260—Metal Spray Powder, easy to apply with a Spraywelder, is tough and long-wearing. Colmonoy C290 has high chromium and nickel content, and also contains wear-resistant chromium borides. Material is especially good for rebuilding crankshafts. *Wall Colmonoy Corp.*

261—Epoxy Dip for encapsulating small electrical components—resistors, capacitors, transformers—covers evenly, doesn't drip. Hysol 10-80 is viscous in bath—coats part as it moves through. On withdrawal, viscosity rises, prevents drip. *Houghton Laboratories, Inc.*

262—Sponge Compounds in the form of two silicone foam rubbers fill voids, cushion, dampen vibrations. Cure at room temperatures, thus avoid heat damage to parts. RTV-160 has greater resiliency than RTV-120 but properties can be varied. *General Electric Co.*

263—Colored Glass Block, blue-green, looks cool, reduces sun-brightness and solar-heat transmission. Can be used on sun-exposed walls, and combined with other clear, patterned, or ceramic-face blocks for attractive effects. In 8- and 12-in. sizes. *Kimble Glass Co.*

264—Surfacing Compound, a plastic metal containing fluorocarbon, protects or patches floors exposed to heavy truck traffic and extreme wear. Metal-Tite comes as a gray paste, spreads with trowel, dries fast. Resists most acids, alkalies, oils. *Dasco Chemical Co., Inc.*

265—Liquid Coating containing aluminum flakes insulates and stops moisture. Aluma-Chron can be painted or sprayed on cement, cinder block, asbestos, and metal surfaces. Comes in colors that combine aluminum properties and paint beauty. *Pace Products, Inc.*

266—Fireproof Fiber Boxes only shred when exposed to a blow-torch flame at 1660 F. for five minutes. Will not ignite or support combustion. Boxes are rigid, lightweight, and low-cost; fire-proofing compound is non-tarnishing. Come in many sizes. *Beacon Boxes, Inc.*

MATERIALS LITERATURE

267—Colored Aluminum Paint. How these paints protect from corrosion, reflect heat, and stop rust is explained in 4-pager (730-1-1). Wide range of colors. Folder illustrates applications. *Reynolds Metals Co.*

268—Polyurethane Rubber. Booklet S-5125 (8 pages) tells about Neothane castable rubber. Lists properties, gives comparison charts. Rubber can be cast to make gears, bearings, pulleys, gaskets, etc. *Goodyear Tire & Rubber Co.*

269—Sound Control Products. This 12-pager (No. 60) describes complete line. Has acoustical data, sizes, finishes, mounting methods, other information for 18 sound-deadening materials and fixtures. *Elof Hansson, Inc.*

270—Phosphor Bronze. Wire, bars, sheet, and special shapes are covered in 20-page handbook. Composition, specifications, and properties of alloys are tabulated for easy reference. Details of castings. *H. K. Porter Co., Inc.*

271—Treated Lumber. Long life and termite-proofing are benefits of the Wolmanizing process of pressure-treating lumber. Catalog W-368 (16 pages) describes salt-preserving process. Illustrates applications. *Koppers Co., Inc.*

272—Metal Packings. Uses in pumps, engines, and compressors are set forth in 24-pager (AD-166). Gives data for selection, application, and installation. Layout sheets help pick right packing. *The Garlock Packing Co.*

273—High-Strength Steels. Unamach I and II are for critical structural applications at high temperatures. Brochure (30 pages) gives rundown on physical and mechanical properties with graphs. *Universal-Cyclops Steel Corp.*

THE RIGHT THERMOSTAT FOR EVERY PURPOSE

ROOM THERMOSTATS
Single-temperature, dual-temperature (day-night, heating-cooling), and submaster thermostats in a wide selection of models. Proportional or two-position action. Direct or reverse acting. Sensitive bimetallic measuring elements. Wide selection of adjusting features.

HEATING-COOLING THERMOSTATS
Two-pipe room types with two bimetallic measuring elements and concealed types with remote bulb liquid filled measuring elements. Direct acting for heating; reverse acting for cooling. Proportional action. Manual or automatic change-over. Choice of adjusting features.

INSERTION THERMOSTATS
Available with liquid-filled sensitive elements and rod-and-tube type sensitive elements. Rigid stem. Proportional or two-position action. Direct or reverse acting. Adjustable sensitivities. Available with pneumatic follow-up movement (pneumatic feedback) for extreme accuracy at low sensitivities.

IMMERSION THERMOSTATS
Wide choice of models with same selection of features as Insertion Thermostats.

REMOTE BULB THERMOSTATS
For applications requiring location of thermostat at a distance from the point of temperature measurement. Liquid-filled measuring elements with capillary lengths to 85 ft. Proportional or two-position action. May be converted from direct to reverse acting. Available with follow-up movement (pneumatic feedback) for accurate control at low sensitivities.

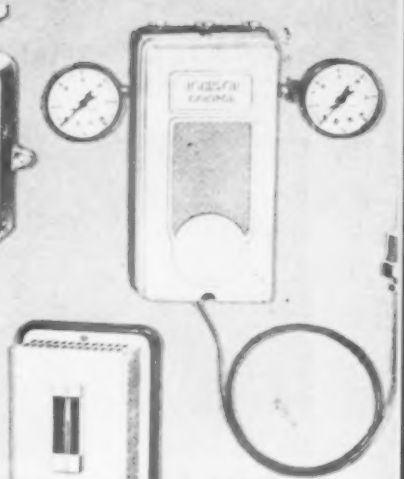
SUBMASTER THERMOSTATS
Insertion, immersion and remote-bulb types. Set point may be varied from a remote point by action of another (master) controller. Available with liquid-filled stem and remote-bulb measuring elements. Direct or reverse acting. Proportional or two-position action.

AIRSTREAM THERMOSTATS
Available with flexible 8-ft. liquid-filled averaging element or rod-and-tube type element. Direct acting, proportional action. Adjustable sensitivity. One- and two-pipe models.

COMFOSTATS
An exclusive Johnson instrument that controls from "effective" temperatures, regulating temperature in proportion to changes in relative humidity. Bimetallic temperature measuring elements; choice of humidity elements. Proportional action. Direct or reverse acting. Single- and dual-temperature room types, insertion type, and submaster type models available.

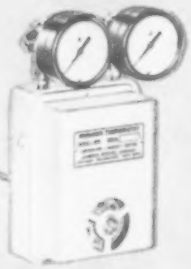
T-409 Insertion Comfostat

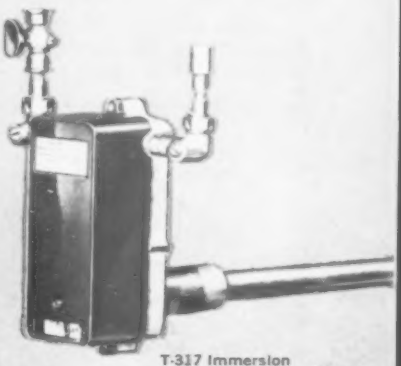
T-271 Heating-Cooling Thermostat

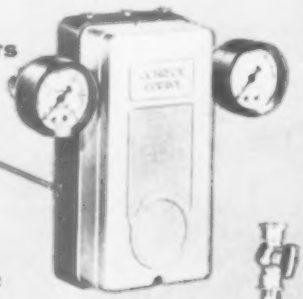

T-900 Liquid-Filled-Remote-Bulb Thermostat

T-411 Submaster Comfostat

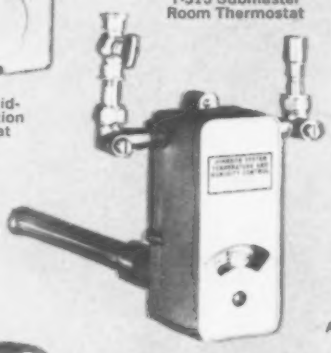
T-408 Room Comfostat


T-802 Liquid-Filled Insertion Thermostat

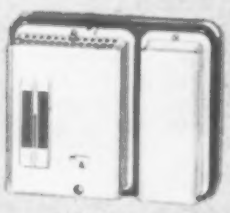

T-317 Immersion Thermostat

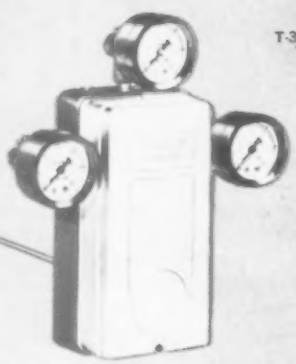

T-902 Liquid-Filled Insertion Thermostat

T-315 Submaster Room Thermostat


T-319 Immersion Thermostat

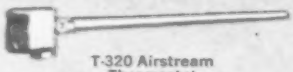
T-335 Submaster Airstream Thermostat


T-435 Submaster Heating-Cooling Thermostat

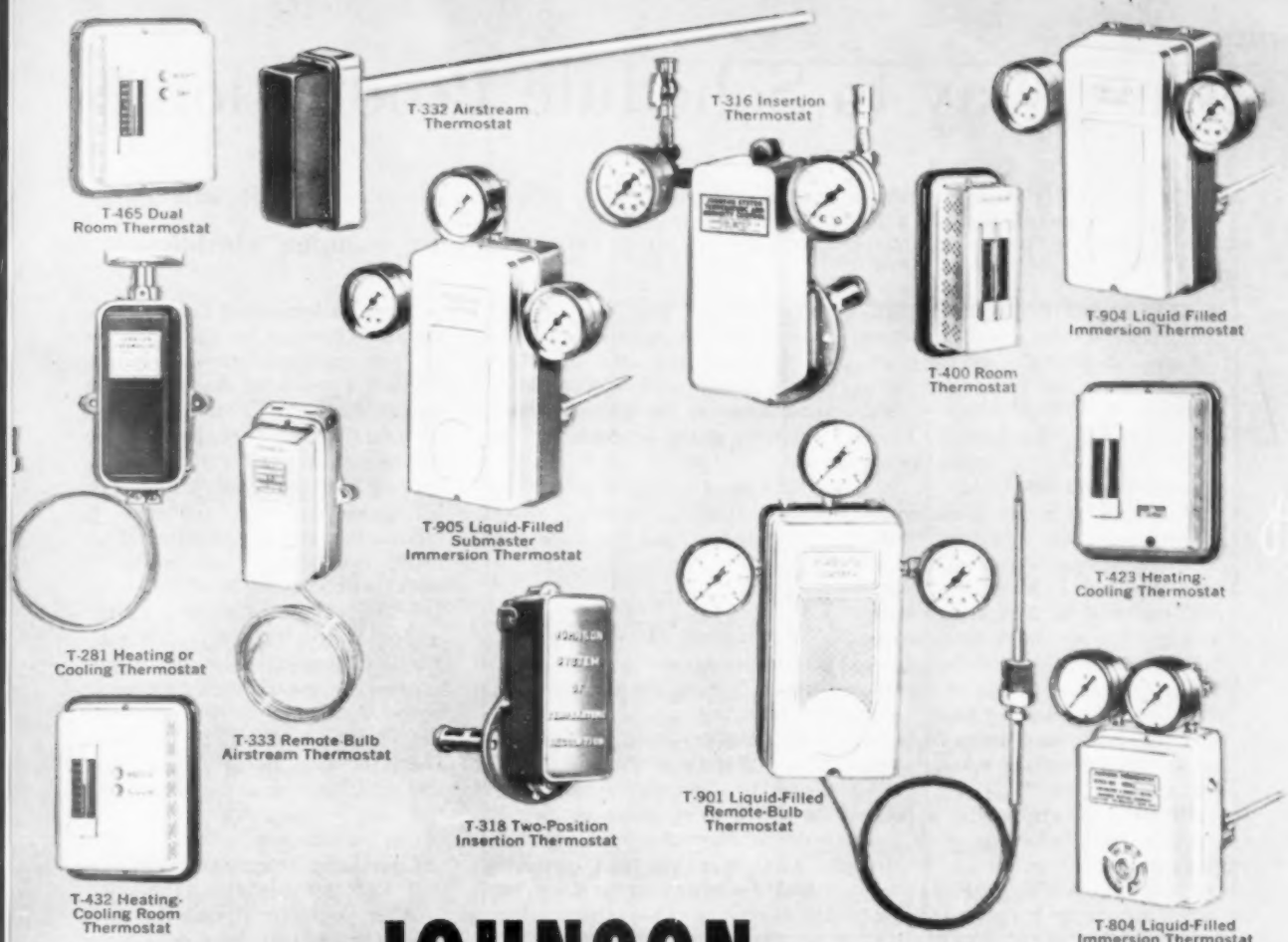

T-903 Liquid-Filled Submaster Insertion Thermostat

T-405 High-Low Room Thermostat

T-418 Dual Room Comfostat


T-320 Airstream Thermostat

T-800 Liquid-Filled Remote-Bulb Thermostat



JOHNSON THERMOSTATS

for Air-Conditioning, Heating, Ventilating, and Process Control

"The right equipment, properly applied" has always been a basic Johnson rule. That's why Johnson makes the most complete line of pneumatic control equipment in the industry, including, of course, a thermostat for every application.

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New Way to Schedule Production

It's the Area-Triangle system. For your job-shop orders it will mean on-the-nose expense estimates, top use of shop capacity, better manning schedules.

A NEW TWIST in production planning. That's what you'll get from the table, the triangle, and the graph at right. They add up to a practical, plant-tested system that's called "Area-Triangle Production Planning." Cost of setting up the system is small. Results are good.

What kind of plant can make best use of this system? Size doesn't matter. The system works as well in small plants as in large ones. What does matter is kind of work. Area-Triangle Production Planning works best in plants where job orders are in the shop for a couple of months or more, from start to finish. For example: heavy machinery, aircraft, and complex electrical and electronic equipment.

How will the system help in these plants? Using it for any given job, you can . . .

- Establish schedule goals.
- Set up a cost budget to control costs while the job is in progress.
- Check feasibility of the schedule —to see whether it's within the capacity of the plant.
- Plan future employment needs.

WHY THE SYSTEM WORKS

It's based on one fact that every production management man knows from his own experience. The fact: If you plot the history of a job order, it will take the shape of a triangle. When a job order begins it doesn't immediately go into full production all over the shop. Planning comes first—engineering, planning and scheduling production, procuring materials, getting and readying the production equipment. Then production starts—fabrication and maybe some subassembly. More and more departments and employees get to work on the job.

By FRANCIS T. KOEN, Missile Systems Division, Raytheon Company, Andover, Mass.
(Area-Triangle Scheduling is the author's own idea and development.)

The truth is, none of the product is fully finished until the time schedule is about half used up. Three events nearly always occur at the same time—at the triangle peak.

- Arrival at the schedule half-way point.
- Peaking of man-hours.
- Delivery of the first lot.

This is the basis for the system.

HOW IT WORKS

Best way to explain how to use this technique is to work out an example. Take the one shown on the facing page:

Assume an order for 800 units with total labor cost of $48,000. At the end of 12 weeks you must deliver the first 8. You must complete the order in 24 weeks.

You know the total production schedule—labor cost (or hours) plotted against weeks—will be a triangle. The labor cost is represented by the area of the triangle. The maximum labor expense, the peak (not the highest week, but the highest point in the highest week), is the height of the triangle.

To find the peak you simply use the formula for the area of a triangle: area = ½ × base × height. You know the area is $48,000; the base, 24 weeks. Solving for height (maximum labor expense) you get:

$$\tfrac{1}{2} \times 24 \times H = \$48{,}000$$
$$H = \$4{,}000$$

At this point you can construct the two charts and the table shown opposite: area-triangle schedule (middle), budget and schedule table (top), and graph of cumulative cost and output (bottom).

- **The Area-Triangle Schedule**—On a piece of ordinary graph paper draw a base 24 units (weeks) long. That's your target date for completing the order. Using any convenient scale, plot the peak of the triangle ($4000, your maximum labor expense) above the midpoint of the base line. This triangle is the means of starting the table.

- **Table of Scheduled Expense and Output**—To start the table you set up five columns as shown. In Column 1 you write down numbers for the weeks. In Column 2 you enter total (cumulative) expense to the end of each week. Total cumulative expense ($48,000), you will remember, is the entire triangle area. It follows that cumulative expense up to the end of any week in the 24 weeks will be the area of the correspondingly smaller triangle or triangles. So to get this figure for each week, first read the height (labor expense) of the right-angle triangle at the week number. For example, the height at Week 3 is $1000. Using the week number as the base and labor expense as the height, find the area. Again, for Week 3, it works out this way:

Cumulative expense (area) =
$$\tfrac{1}{2} \times 3 \times \$1000 = \$1500$$

After you have passed the peak week (No. 12) in the schedule the easiest way to calculate budget expense is to subtract the area of the right-hand, right-angle triangle from the total budget, $48,000. For example, the cumulative expense at the end of Week 15 is:

$$\$48{,}000 - (\tfrac{1}{2} \times 9 \text{ weeks} \times \$3000) = \$34{,}500$$

You can find the budget expense for each week (Column 3 of the table) by subtracting the cumulative expense for the previous week from that of the current week. The budget expense for Week 3, for example, is $1500 − $667 = $833.

- **Graph of Cumulative Expense and Output**—This is constructed on log-log graph paper. It's a performance improvement curve (FACTORY, September 1959, page 98).

The schedule calls for delivery of 8 units at the end of 12 weeks and 800 units at the end of 24 weeks. The Table of Cumulative Expense and Output shows a cumulative expense of $24,000 at the end of 12 weeks. This figure, with 8 units, provides one point on the chart.

Turn the page

Job budget and schedule . . .

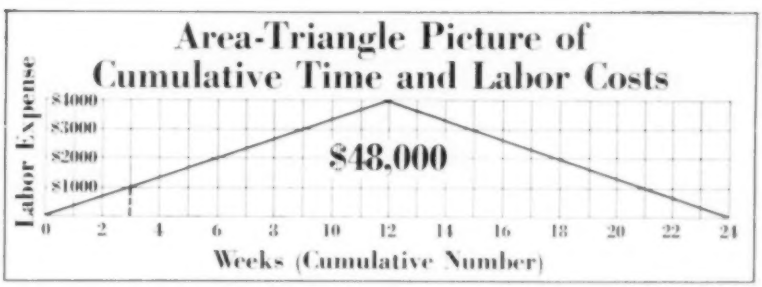
This table will guide you, week by week, on payroll and units to be produced to fill a job-shop order. Cumulative labor costs (Column 2) are derived from simple triangle below. Cumulative units to be produced are derived from log-log graph below. To find costs or units to be completed in any one week, subtract previous week's cumulative figure from current week's cumulative figure.

Budget and Schedule Table

1 Week	2 Cumulative Expense	3 Week's Expense	4 Cumulative Output	5 Week's Output
1	$ 167	$ 167	↑	↑
2	667	500		
3	1,500	833		
4	2,667	1,167		
5	4,167	1,500	Preparation and	
6	6,000	1,833	Start-Up—No	
7	8,167	2,167		
8	10,667	2,500	Units Completed	
9	13,500	2,833		
10	16,667	3,167		
11	20,167	3,500	↓	↓
12	24,000	3,833	8	8
13	27,833	3,833	20	12
14	31,333	3,500	45	25
15	34,500	3,167	85	40
16	37,333	2,833	140	55
17	39,833	2,500	210	70
18	42,000	2,167	300	90
19	43,833	1,833	400	100
20	45,333	1,500	500	100
21	46,500	1,167	590	90
22	47,333	833	670	80
23	47,833	500	740	70
24	48,000	167	800	60

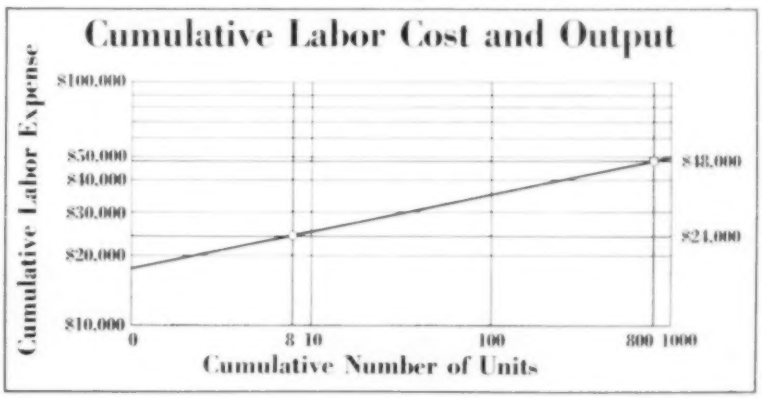
. . . comes from simple triangle

Total area shows labor cost for a production job (for example, $48,000). From this triangle you can derive peak labor cost ($4000) and cumulative weekly cost. Cumulative costs are entered into Column 2 of the table above. Triangle construction is explained in the text.



. . . and this log-log graph

From this, by plotting known cumulative units vs. known cumulative labor costs at two points (for example, 8 vs. $24,000 and 800 vs. $48,000), you derive cumulative units to be produced at the end of every week in the schedule. Cumulative units go into column 4 of budget and schedule table.



MODERNIZE DC Cranes with EC&M "PT" Magnetic Control

Three-motion crane serving scarfing area in mid-western steel plant uses "PT" control for bridge, trolley and hoist motions. EC&M Tab-Weld resistors are mounted on bridge foot-walk. Two "PT" controllers, replacing manual controllers, are mounted at front of cab. Third controller is at rear of cab, and all three master switches are up front within easy reach of operator. Since converting to "PT" control, there is more room in cab.

Is *manual* control penalizing crane operation in your plant? Are motors and machine subjected to abnormal conditions during acceleration and plugging? Is output affected by the slower reaction of operators as they tire under the strain of manual control on an all-day's run?

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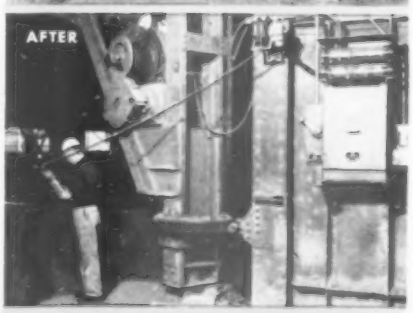
The illustrations shown here are typical of the acceptance of EC&M "PT" control for DC Cranes. One plant has a modernization program under way involving dozens of cranes. Physically, "PT" control occupies about the same space as manual control. The cost is comparable, too.

Convert now to "PT" control. This *magnetic* control is far superior to manual control.



Jib crane, shown at top with old manual controller, is now operated by "PT" magnetic control (bottom). Pendant pushbutton provides remote control, gives operator better view of open hearth floor. "PT" control can be operated, without change, by either master switches or pendant pushbutton. "PT" control is front wired, front accessible, for mounting against walls or crane girders.

Write for complete details on "PT" crane control. Ask for Bulletin 6131.

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You determine the second point by $48,000 cumulative expense and 800 units of cumulative output. You can draw a line through these two points because the curve on ordinary graph paper is represented by a straight line on log-log graph.

Now you can complete the table. Starting with Week 13, and for each cumulative expense figure in Column 2, read the cumulative output from the log-log chart. Enter these output data in Column 4. Now you can find the weekly scheduled output by subtracting the previous week's cumulative output from that of the current week.

The completed Table of Cumulative Expense and Output is your budget and schedule for the job.

GUIDES FOR USING IT

• **Get the big picture**—Nearly every job-shop plant has more than one order in the shop at any given time. If you give each selected order its own area-triangle, you can add the area-triangles of all significant orders and thus get a quick and easy picture of utilization of plant labor capacity. But there's no advantage in applying this technique to orders of short duration. The large volume of area-triangles would be unwieldy for control.

• **Watch the time period**—The example problem was based on weekly data. The area-triangle method works best on this shorter time period. But if you want to use the results in monthly summary form, you can do so by converting weekly figures, with some interpolation, into monthly totals.

On jobs of long duration you can use monthly data to construct the charts. But you should use weeks for your time scales. Count and plot the equivalent weeks in each month for which you use data.

• **Check capacity**—Compare the peak of the area-triangle with the plant capacity in terms of labor hours or dollars. If the peak is beyond plant capacity, you'll know you must boost capacity with overtime, extra employees, or whatever is feasible. If you want to hold the peak within capacity, then, you must extend the schedule.

Turn the page

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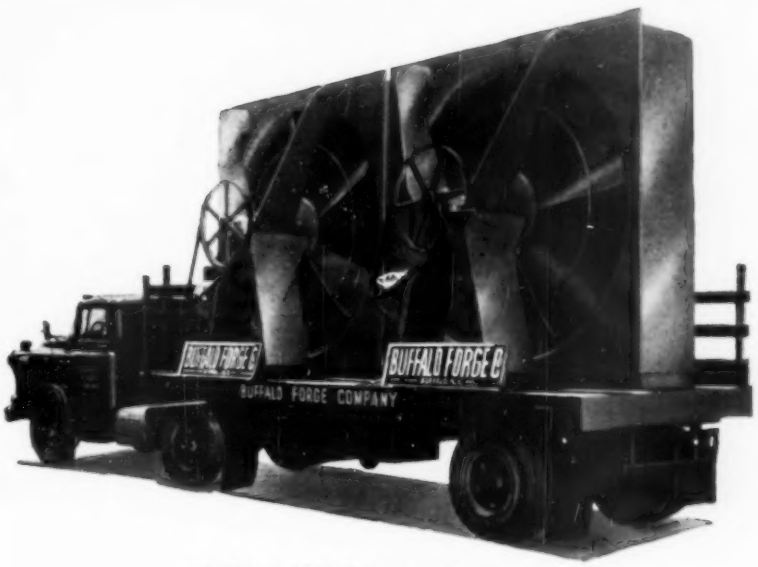

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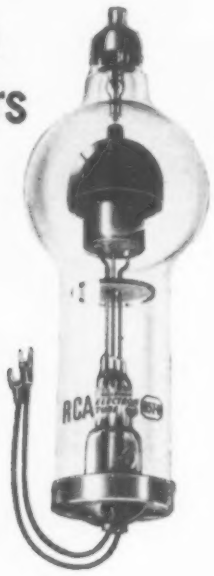

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On the other hand, you may want to use all your plant labor capacity to shorten the time schedule. If this is what you want, substitute the known values for the height (capacity) and area (total estimated or contract labor expense) of the triangle in the area formula. Solve for the base—the cumulative weeks for completing the order.

• **Check cost estimates**—If the performance improvement curve in the cumulative expense and output chart has a steep slope, look out for trouble. The cost estimate may be wrong. Or the time schedule could be out of line. It could be both are unrealistic. Check both to see if they're valid.

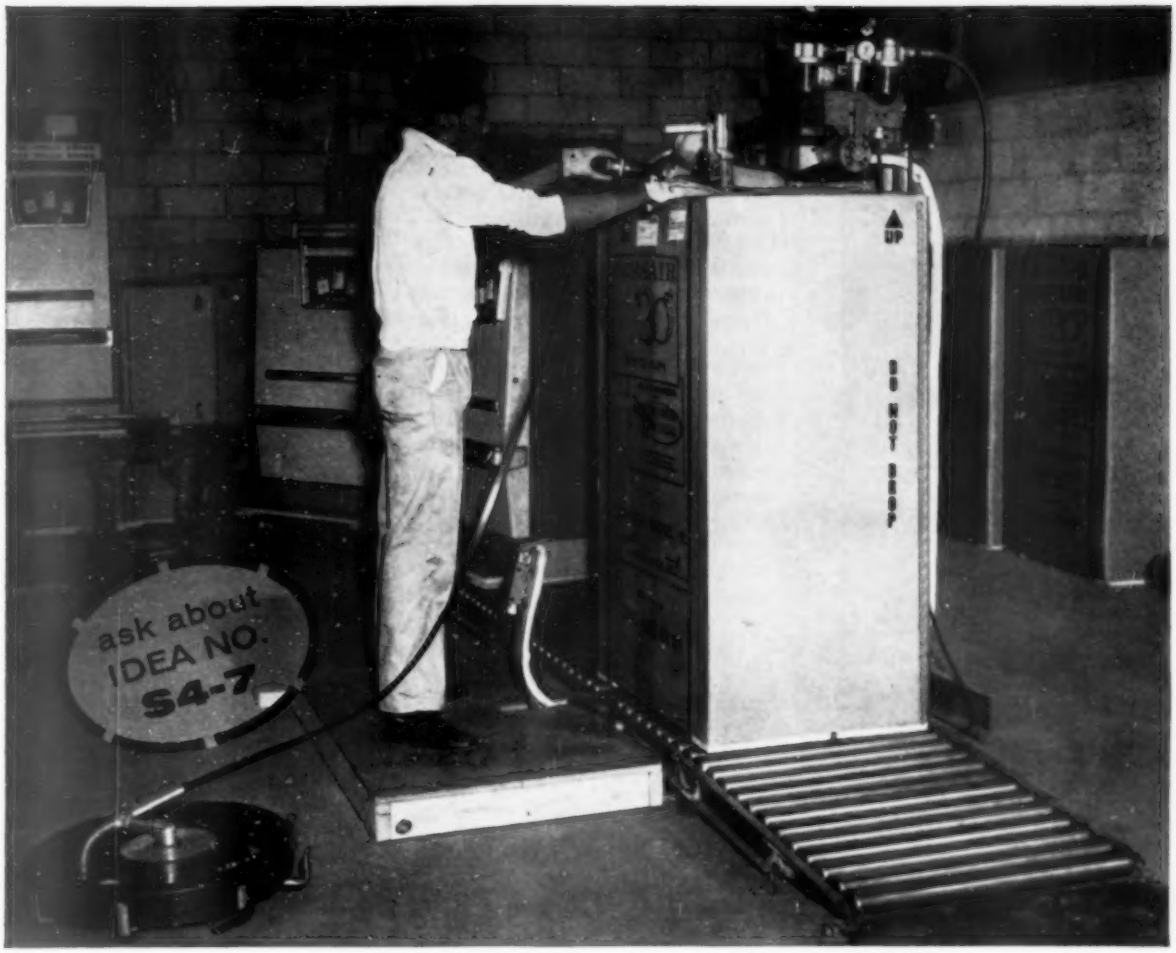
• **Locate the peak**—For most jobs the peak of the area-triangle will fall at the midpoint of the time schedule. But not always. Some orders may peak a little ahead of the midpoint. Those that peak behind it are rare. Where they peak is related to the rate of performance improvement. Experience with your types of orders will show you which way different types will fall.

• **Use it for control**—Don't overlook the merits of the area-triangle plan for management control of job cost and schedule. Using the technique on an order provides an over-all budget of both cost and schedule. It's on a weekly basis—a good period for quick action if you can fill in the actual figures for comparison. Or you can use it with monthly summaries. Either way, you can add this control for individual orders to whatever departmental controls your present system provides.

• **Don't use it for a cure-all**—You can't replace regular production scheduling and cost accounting with the area-triangle method. The emphasis of this new technique is on the over-all planning of delivery schedule and job cost.

You still need detailed scheduling of departments to meet your area-triangle goals. But the area-triangle plan won't disrupt normal cost accounting. In fact, if you are using a job-order cost system now, it will fit in very nicely.

• **Supplement with short-cut mathematics**—You won't find any complex mathematics in this presentation



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of the area-triangle method. But if you want to go mathematical, here are some formulas to make calculations easier and more precise.

1. To find the time-to-peak of an area-triangle, having a performance-improvement curve, there are two formulas (U = total units in order; u = a smaller number of units for which the time in weeks to produce can be determined; T = total schedule time in weeks; t = time in weeks to peak of triangle; W = time to produce completely u number of units; N = slope of the cumulative average curve):

If the time to make u units (W) is less than the time to peak (t), use this formula:

$$t = \frac{W^2}{T}\left(\frac{U}{u}\right)^{N+1}$$

If the time to make u units (W) is greater than the time to peak (t), use this formula:

$$t = \frac{T(u)^{N+1} - (U)^{N+1}\left(2W - \frac{W^2}{T}\right)}{(u)^{N+1} - (U)^{N+1}}$$

2. To compute cumulative expenses (area-triangle chart) there are two formulas that make it unnecessary to measure the height of each weekly triangle in the chart (E = total labor cost for the order; e = cumulative expense for a portion of the area-triangle chart; T = total schedule time in weeks; t = time in weeks to peak of triangle; W = week number for which cumulative expense is calculated):

For cumulative expenses prior to the peak, use this formula:

$$e = \frac{EW^2}{Tt}$$

For cumulative expenses after the peak, use this formula:

$$e = \frac{E}{T}\left[\frac{2(WT) - W^2 - (tT)}{T - t}\right]$$

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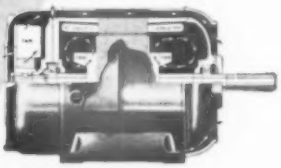

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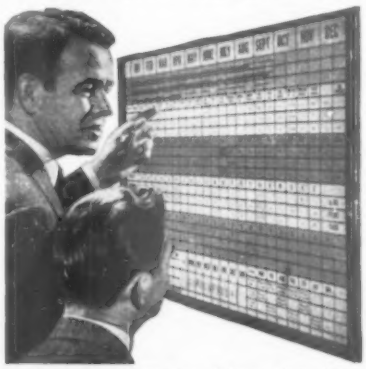

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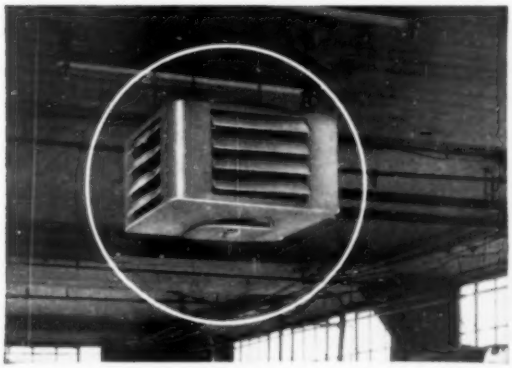

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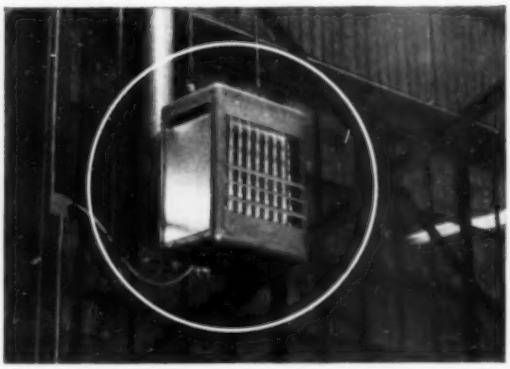

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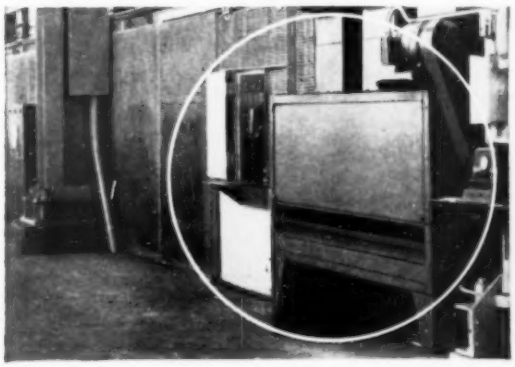

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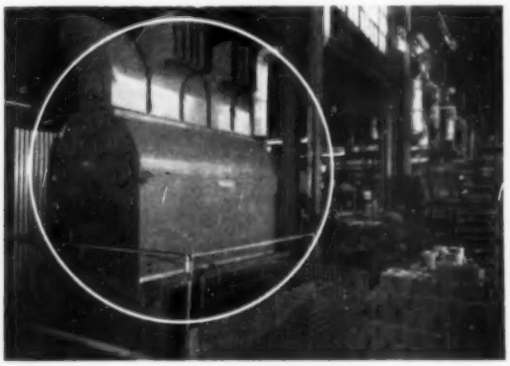

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Modern Management in Action

This new book aptly demonstrates the two major directions of an industrial manager's job. These are the administrative and organizational phases, plus the engineering and technical side. In *Management in Industry*, the author, Claude S. George, Jr., approaches these directions with firmness of purpose, clarity of expression.

While this book is designed primarily as a textbook, plant management people and their associates will find it a refreshing review of fundamentals. What's more, it is right on top of recent developments in management techniques. It has brief, helpful sections on work sampling, operations research, equipment replacement policy, linear programing, ABC inventory control policy, and many other techniques finding popular application today.

Two chapters stand out as unusually valuable. First one is Management Aids to Decision Making. It moves from a sound analysis of basics to practical examples of break-even evaluation. Then it updates all concerned with a discussion of electronic data processing and operations research.

Second important chapter, Business Statesmanship, summarizes the attitudes and actions of businessmen in carrying out their broader responsibilities to society. It treats realistically and objectively relationships with stockholders, employees, customers, and the public.

Management in Industry is divided into eight logical parts. Together they cover the field well. While few subjects are treated in depth to sufficiently merit handbook stature, there is plenty here for the old pro as well as the beginner. Sections cover management and the firm; organization; product development and standardization; factory planning (including chapters on plant location, industrial lighting, noise, and plant climate); machines and equipment; employee relations; work measurement and simplification, and wage payment; and control procedures. Each chapter concludes with a company case study pertinent to the chapter's subject, plus a list of review questions.

Management in Industry, by Claude S. George, Jr. Prentice-Hall, Inc., Englewood Cliffs, N. J. 585 pages. $10.

Handbook on Plant Engineering

Here's a giant-size compilation of information covering 92 important elements of plant organization, design, construction, operation, and maintenance. It tells how any plant can be run more efficiently and economically.

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Plant Engineering Handbook, William Staniar, Editor-in-Chief. Mc-Graw-Hill Book Co., 330 West 42nd St., New York 36. 2150 pages. $23.50.

Covers Field for Small Company

"A specialized management bookshelf." That's a capsule comment on *Management for the Smaller Company*. But this bookshelf is digested into a single reference. The small company—in this case one with fewer than 1000 employees—has problems that big company answers won't always solve. As the introduction puts it, "the problems may be the same; the answers may not."

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gerial theories slanted to the small businessman. The book is tailor-made for small plant management. The authors are 35 executives and specialists who have had extensive, varied experience in small company management.

Surprisingly diverse, the book gives concrete answers to the small plant man's questions, including . . .

- How can I build a strong managerial reserve?
- What planning must I do to keep up with the big fellows in manufacturing and marketing?
- Where do I go for outside help on financial and tax problems?
- What about my labor union?
- How do I go about getting government contracts?

It's all here—and more besides. The strong point of the book is its ability to get to the heart of the problem and offer specific answers. No abstract philosophy here; just a highly readable tool for small company management. Graphs, charts, outlines and case histories help convey information easily, rapidly.

Management for the Smaller Company. Ed. by Elizabeth Marting. American Management Assn., 1515 Broadway, New York 36, 402 pages. $9.

Working Tool on Buildings

As the title suggests, here is a good reference of industrial architectural drawings intended for the engineer in the plant. *Industrial Building Details* offers virtually no text. It presents a wealth of detailed drawings, all precisely scaled. The variety of structures covered includes ventilators and stack curbs, ladders and platforms, hatch covers, door frames, walls, windows, and many more. A complete key to symbols and abbreviations is also included.

This second edition (the first was published privately) can help plant managers and engineers evaluate and interpret blueprint details. *Industrial Building Details by Duane F. Roycraft. F. W. Dodge Corp., 119 West 40th St., New York 18. 356 pages. $12.75.*

For more facts Circle 626 on Reader Service Card

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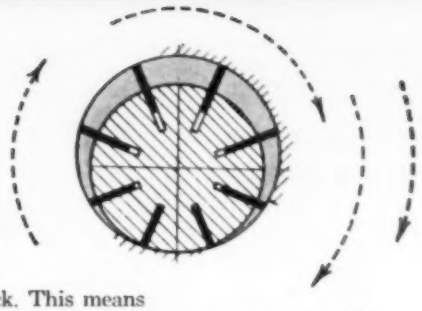
Smooth and Tough



Rotary motion cuts vibration — eliminates shock. This means savings in maintenance and installation. That's why the story of the *Ro-Flo* compressor is important to you.

They're being used successfully on hundreds of applications including: air hoists, lifts, pneumatic tools, sandblasting, blowing castings, and air chucks.

Another advantage is constant efficiency. The fall-off in efficiency, inevitable with other units, never takes place with a *Ro-Flo* compressor.

For smoothness, for toughness, for simplest installation and easy maintenance, choose the *Ro-Flo* compressor.

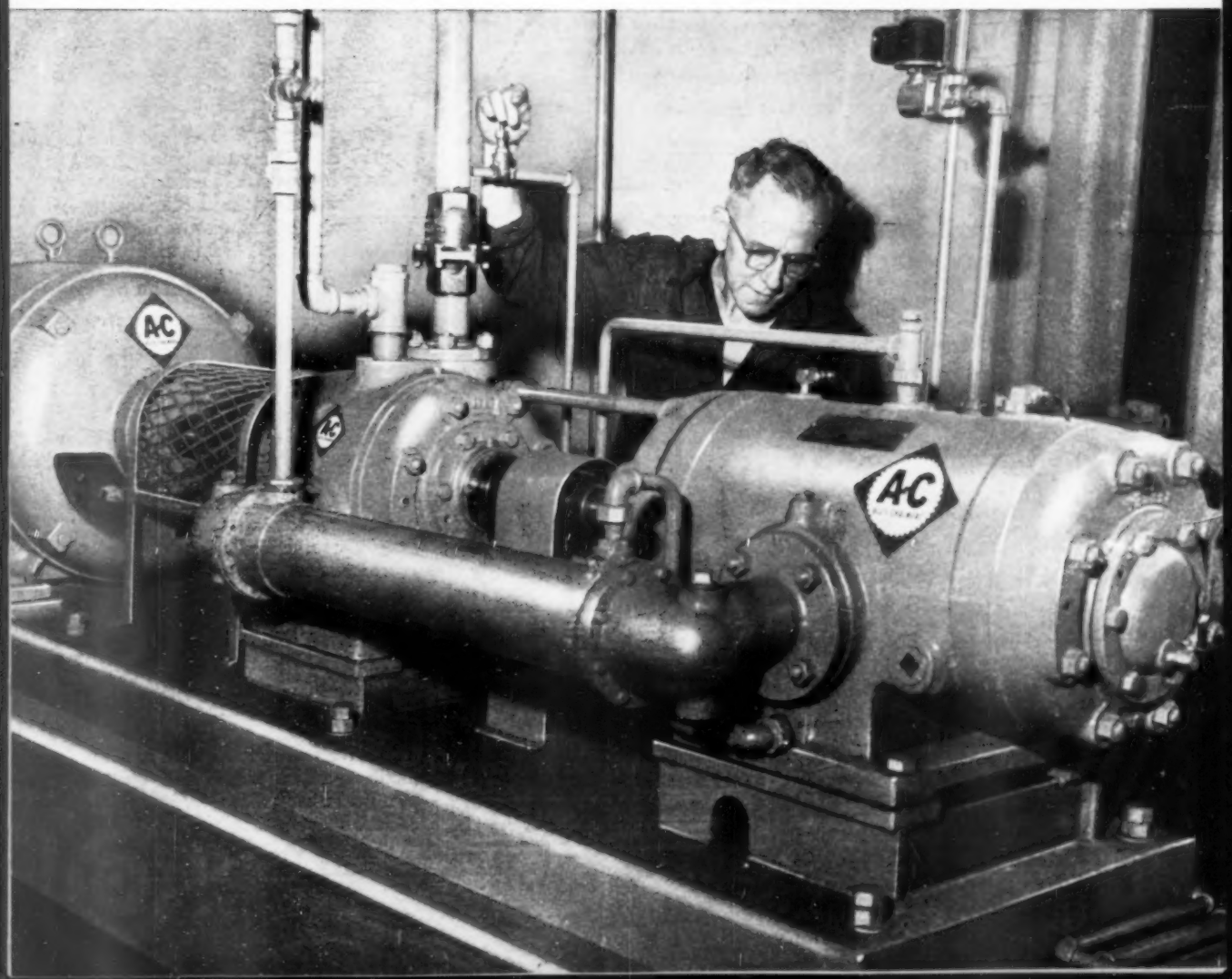
Get bulletins 16B8244 and 16B8126. Call your nearby A-C office or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.

Ro-Flo is an Allis-Chalmers trademark.

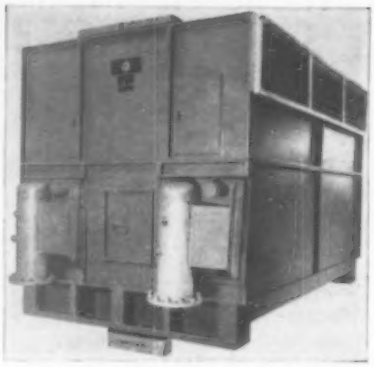
Ratings: Pressures to 125 pounds gauge. Volumes 40 to 3000 cfm.

ALLIS-CHALMERS

A-5960-G1



REDUCE OPERATING COST of VACUUM SYSTEMS with this "AERO" (air-cooled) VAPOR CONDENSER



Niagara Aero Vapor Condenser Panel Casing construction gives access to all parts, saves first costs in shipping and installation.

With free air the cooling medium, you use the least water, evaporated in the air stream. You save the cost and pumping of large volumes of condensing water.

Air-vapor subcooling reduces mixture evacuated from the system, saving in the operation of steam ejector or vacuum pump.

This air-cooled condenser gives you more capacity than other types at a substantial saving of steam and power. Water supply, scaling treatment and disposal problems are eliminated.

You get pure condensate, an improved product; often profit by recovery of residues now wasted. There can be no contamination of your product at any time; it never touches raw water. Condensing, of water, of solvents or of your product, is simplified; you have one, compact, easily maintained unit replacing both cooling tower and barometric or surface type condenser.

Maintenance expense is low. Niagara Aero Vapor Condenser Panel Casing construction gives access to all parts, saves first costs in shipping and installation. Summer-winter dampers and Balanced Wet Bulb Control provide precise, year 'round adjustment of capacity to load.

Constant temperature, uniform products and maximum production 12 months a year are assured. Capacities up to 15 million BTU/hr.

Write for full information. Ask for Bulletin 129R

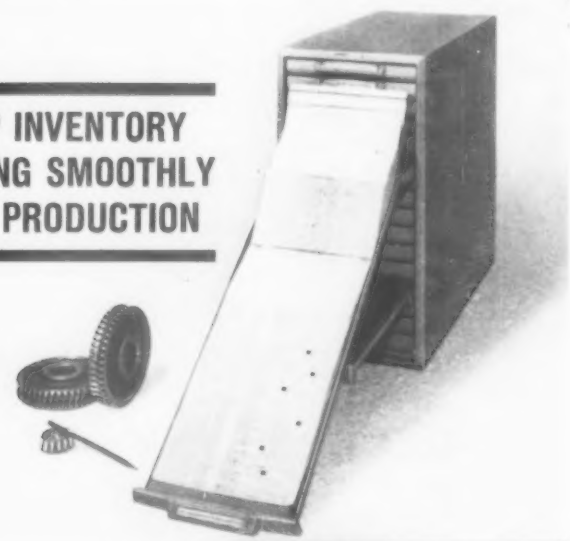
NIAGARA BLOWER COMPANY

Dept. F-10, 405 Lexington Ave., New York 17, N.Y.

Niagara District Engineers in Principal Cities of U. S. and Canada

For more facts Circle 628 on Reader Service Card

KEEP INVENTORY MESHING SMOOTHLY WITH PRODUCTION



Acme Visible Cabinets give you inventory control at a glance

With an Acme Visible Control System on guard, there'll never be shortages in materials or equipment, or spare parts to interrupt the smooth flow of production. Inventory facts are at your fingertips. Visible signals flag your eye whenever an item needs reordering. For full facts on how you can control inventory this easy, efficient way . . . mail the coupon.

ACME VISIBLE

Acme Visible Records, Inc. 3119 W. Allview Dr., Crozet, Va.

To learn how my company can cut costs, increase efficiency—send free folders on systems for: ( ) Inventory Control ( ) Production Control

NAME_____

POSITION_____

COMPANY_____

CITY_____ STATE_____

FACTORY FILMS

A Tale of Two Towns demonstrates efficient fire department salvage operations and how the work can be done without additional manpower and equipment. Film includes common sense rules for salvage procedures. Fires shown are real scorchers—they were set off in some condemned buildings. 16mm, color, 20 min. For loan, write:

Bureau of Communication Research, 267 W. 25th St., N. Y. 1.

Person to Person Communication analyzes major barriers to face-to-face communication and gives specific, practical methods for overcoming the barriers. Points up how our understanding of people, and events, depends upon successful communication of words from one person to another. Includes discussion leader's guide and participants' manual to explain the film program. 16mm, sound, b&w or color, 14 min. For loan or purchase, write:

McMurry-Gold Productions, 139 So. Beverly Drive, Room 333, Beverly Hills, Calif.

Impact tells the story of natural gas—it has over 25,000 different industrial uses. Now the sixth largest industry in America, it employs millions of skilled workers. Film shows how gas wells are discovered and the gas "scrubbed" of impurities and transported. 16mm, color, 26½ min. Write to:

Modern Talking Picture Service, Inc., 3 East 54th St., New York 22.

Applying the Principles of Motion Economy is a work simplification training film. 28 principles of motion economy are explained and applied to four successively harder bench tasks. Emphasizes saving motion, preventing fatigue, use of simple mechanical fixtures, and careful selection of hand tools. 16mm, b&w, sound, 25 min. Write to:

Modern Talking Picture Service, Inc. 216 E. Superior St., Chicago 11.

Selected Motion Pictures 1959-60 is a 44-page catalog describing many free and rental 16mm motion pictures in various fields. Write:

Association Films, Inc., 347 Madison Ave., New York 17.

For more facts Circle 629 on Reader Service Card

For more facts Circle 630 on Reader Service Card ➤

You can save up to 20% on close-coupled pumps

Capacities to 2500 gpm, heads to 550 ft.

Now from Allis-Chalmers: Close-coupled pumping units powered by *Super-Seal* motors with *Poxeal* insulation!

You can save up to 20% by specifying these units. Reason: Open-type *Super-Seal* motors may be used in many areas previously requiring more costly enclosed motors.

In addition to moisture-defying *Super-Seal* motors, these pump units offer heavy-duty construction, easily replaceable wearing rings, balanced impellers, plus other quality pump features. It all adds up to a cost-saving pumping package for a wide variety of installations.

Contact your A-C representative or distributor for coordinated pumping equipment — pumps, motors, control and drive. *Or write Allis-Chalmers, General Products Division, Milwaukee 1, Wis.*

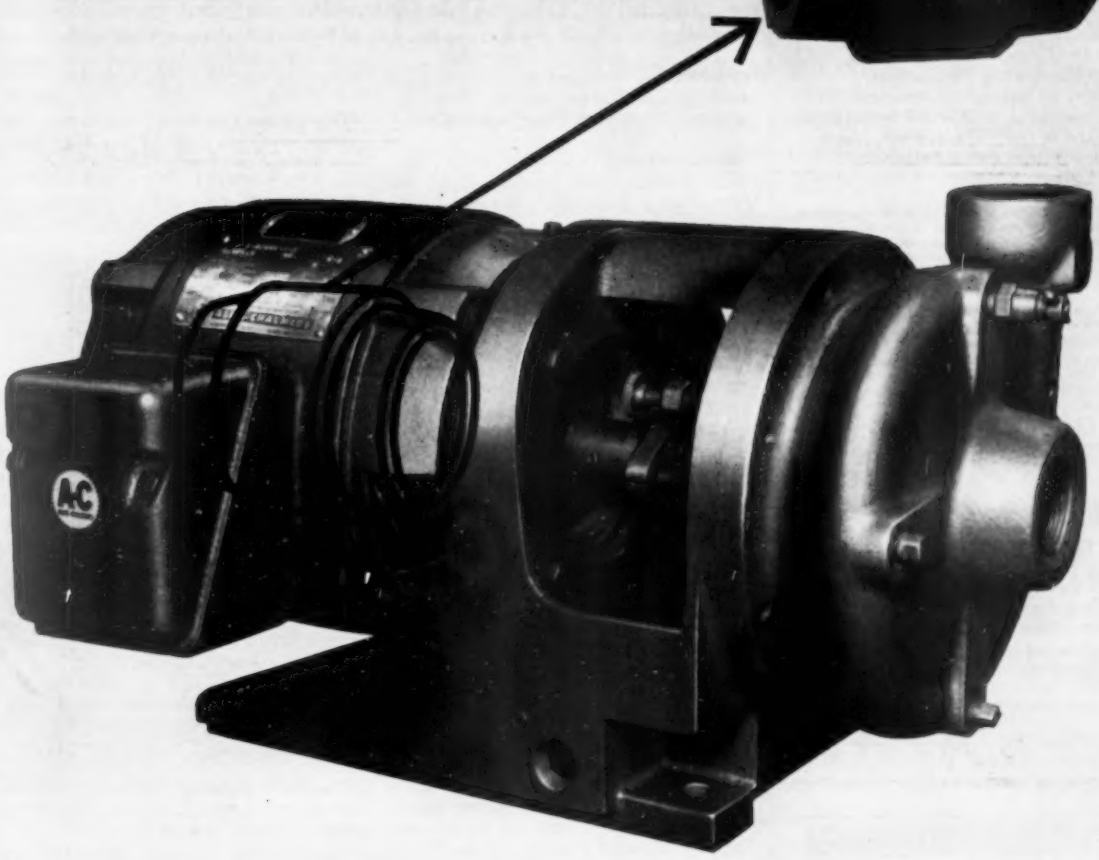
ALLIS-CHALMERS

A-5883-G1

Plan to stay ahead... MODERNIZE!

POXEAL insulation system of *Super-Seal* motors provides a stator completely impervious to contaminating elements. Result: A close-coupled pump with an open-type motor that can "take" the toughest atmospheres.

Super-Seal and Poxeal are Allis-Chalmers trademarks.



The telephone that calls you by name!

The new DuKane Flexiphone calls you by name . . . *your name!* You know the call's for *you*, whether you're at your own desk, in a conference, or anywhere in the plant or office. To reach an associate, you simply pick up your own phone and say, "Mr. Smith, please." No buttons, no dials, no tricks. Wherever Mr. Smith may be at the moment, he simply picks up the nearest Flexiphone, and you're in immediate two-way, *private* telephone contact! The DuKane Flexiphone is truly the newest, most versatile internal communication system today.

PRIVATE TELEPHONE: the Flexiphone provides instant communication for vital business information, to speed up orders, answer customer inquiries, expedite materials flow, all without tying up your outside lines.

PAGING: the Flexiphone is your tool for reaching key men when you need them, giving instructions, getting information *fast*.

BACKGROUND MUSIC: music from FM radio or records can be easily and inexpensively distributed to all or any group of stations in the Flexiphone system. Lifting the receiver of any phone cuts off the music at that location.

For more information on how the unique DuKane Flexiphone can serve your business, write or call

DuKANE CORPORATION
St. Charles, Illinois

DuKane Corporation, Dept. F10S,
St. Charles, Illinois

Please send me information on the new DuKane Flexiphone.

Name_____

Company_____

Address_____

City & State_____

DuKane products are sold and serviced by a nationwide network of engineering distributors

ADVERTISERS' LITERATURE

Offered in ads received up to 5th of last month. To get items you want, circle numbers on Reader Service Card next to back cover.

MAINTENANCE

346—Vibration Mounts. Free "Facts" book for complete data on Level-Rite "200" mount. Unisorb Div., Felters Co.

347—Lubricants. Free "Lubriplate Data Book" is a valuable treatise on lubrication. Lubriplate Div., Fiske Bros.

348—Industrial Wipers. Booklet (24 pages), "Industrial Wiping—an area where costs can be cut!" Scott Paper Co.

349—Adhesive Finish. Descriptive bulletin on use for dull, damp, or damaged walls. Swift & Co.

350—Lubricants. Free literature on Litholine industrial grease for all types of bearings. Sinclair Refining Co.

351—Floor Cleaning Machine. Literature gives complete data on combination scrubber-vacuum. Finnell Systems, Inc.

352—Machinery Mounts. Report, "Resilient Mountings as Applied to Production Machinery." Barry Controls, Inc.

353—Paint. Comprehensive illustrated book explains principles of color dynamics. Pittsburgh Plate Glass Co.

354—Lubricants. Free copy of "Management Practices that Control Costs via Organized Lubrication." Texaco, Inc.

PLANT SERVICES

355—Duct Systems. Catalog contains data on unplasticized PVC sheet stock and joining strips. Colonial Plastics Mfg.

356—Aero Vapor Condenser. Bulletin 129R gives full information and cost-saving features. Niagara Blower Co.

357—Steam Generators. Bulletin SG-100 explains features of packaged electric steam generators. Pantex Mfg. Co.

358—Air Conditioning. Government document, "Influence of Air Conditioning on Work Production." Carrier Corp.

359—Cabinets. Literature gives complete data on two styles of swinging-door cabinets. Burroughs Mfg. Co.

360—Propeller Fans. Bulletin FM-315 gives complete facts. Capacities 500 to 250,000 cfm. Buffalo Forge Co.

361—Lamps. New 20-page picture paper, "Facts of Light." Data on lamps and lighting. General Electric.

362—Water Pumps. Bulletin 975-F. 1- to 6-in. discharge sizes. Capacities up to 1100 gpm. Buffalo Pumps Div.

363—Compressor. Bulletin WB-10. Capacities from 142 to 1150 cfm. displacement. Gardner-Denver Co.

364—Glass Tinting. Booklet, "Solve Sun Problems with Sun-X," gives full data. American Glass Tinting Corp.

365—Safety Containers. New complete safety engineering equipment catalog and manual. The Protectoseal Co.

366—Compressors. Bulletins 16B8244 and 16B126 give data on rotary compressors. Allis-Chalmers Mfg. Co.

367—Unions, Fittings. Descriptive brochure on complete line of pipe unions and fittings. The Fairbanks Co.

368—Valves. Piping-practice wall chart on valve selection, installation, maintenance. The Lunkenheimer Co.

369—Steel Equipment. Catalog illustrates complete, diversified line of steel equipment. Lyon Metal Products, Inc.

370—Drain Cleaners. Literature tells about complete line of drain cleaning equipment. Kollmann Mfg. Co.

371—Wire Partitions. Bulletin P-55 gives structural features and adaptability. Wire and Iron Products, Inc.

372—Steam Heating Specialties. Free Brochure 1501 describes complete line and features. Dunham-Bush, Inc.

373—Dust Collectors. Illustrated folder lists over 38 standard models to choose from. Aget Manufacturing Co.

374—Gas Turbines. Bulletins 162 and 163-1 contain complete mechanical data and applications. Plus illustrations. Clark Brothers Co.

BUILDINGS

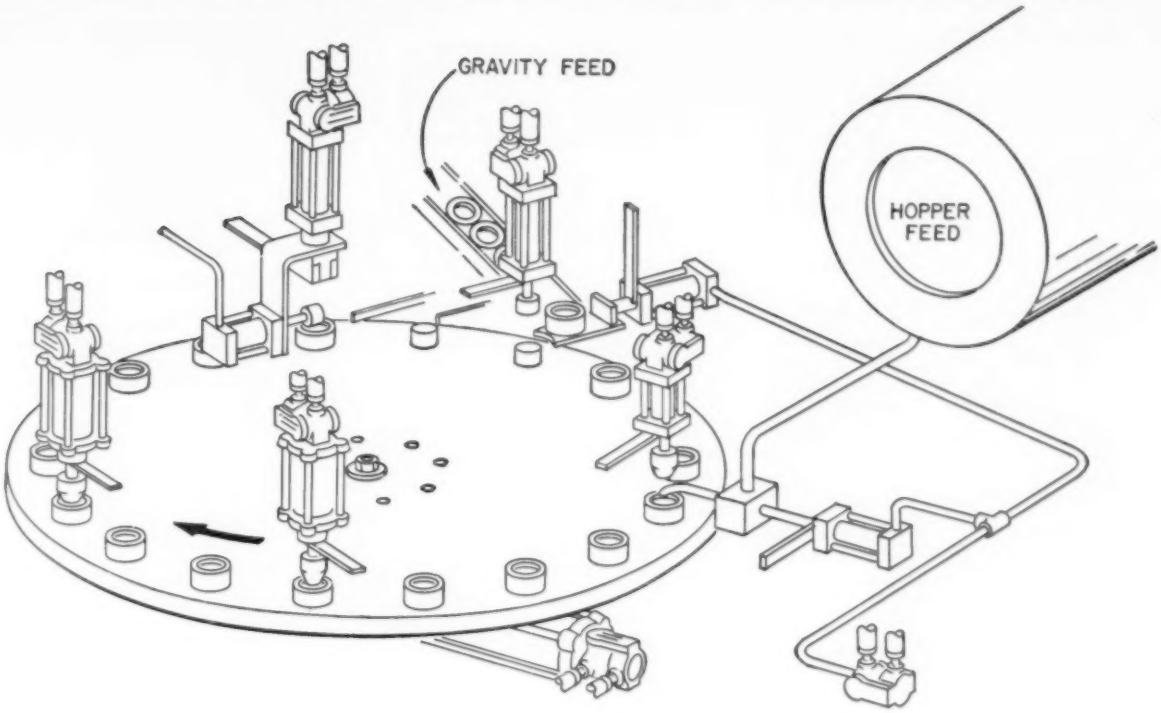
375—Acoustic Panels. Free folder gives complete data to help solve sound-control problems. The Eckel Corp.

376—Abrasive Tread Plate. Application, design, fabricating data on non-slip tread plate. Aluminum Co. of America.

377—Steel Grating. Bulletin 2527-R shows how to specify type of grating best suited to need. Blaw-Knox Co.

Turn the page

THIS BELLOWS "SPOT-A-MATION IDEA" SAVED $82,754.00

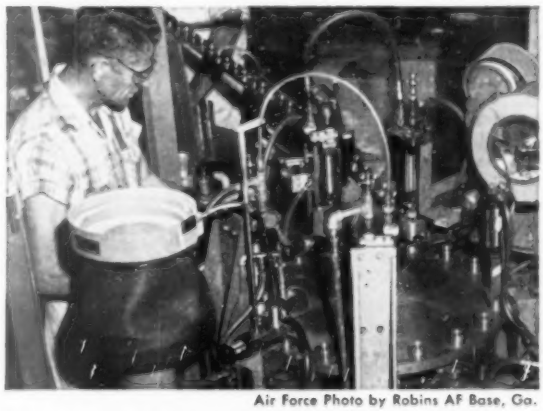


Engineers at the Naval Ordnance Plant, Macon, Georgia, were given the assignment to "effect major production economies" in the assembling of explosive components for ordnance use. The operations were being performed manually by 33 people. The engineers designed and built two automatic assembly machines, each using a Bellows Rotary Index Table and five explosion-proof Bellows Air Motors. The savings on direct labor costs alone on one contract amounted to .0109 man-hours per assembled part for a total dollar savings of $82,754.00.

This same basic idea can be readily adapted to handle an almost unlimited range of small parts assembly procedure: staking, crimping, screw or stud placement, welding partial or complete small assemblies, etc.

It is typical of the many ways ingenious engineers "spot-automate" costly and troublesome production centers with Bellows "Controlled-Air-Power" Devices.

Chances are that many such opportunities exist in your plant. Why not investigate today?



Air Force Photo by Robins AF Base, Ga.

The savings of $82,754.00 made through these automatic assembly units are based on direct labor costs and are exclusive of any possible savings from reduced overhead. In addition, 1000 sq. ft. of floor space was released for other operations.

THIS "SPOT-A-MATION IDEA" FILE IS YOURS ON REQUEST

Contains installation data, wiring diagrams and equipment lists for the assembly idea sketched above, as well as a score of other "Spot-a-mation" ideas you can use. Write Dept. FA1059. The Bellows Co., Akron 9, Ohio.

1492-B

The Bellows Co.

DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

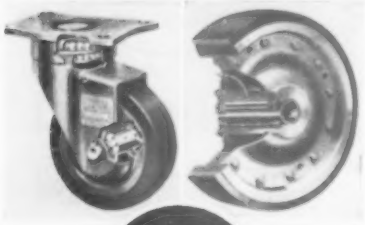
AKRON 9, OHIO

OTHER INDUSTRIAL DIVISIONS OF IBEC: Sinclair-Collins Valve Co., Valvair, Akron, Ohio • V. D. Anderson Co., Cleveland, Ohio

ENGINEERED for DEPENDABILITY,

DARNELL CASTERS & WHEELS

offer long range economy



A TYPE AND SIZE FOR EVERY PURPOSE

for added efficiency . . .

extra economy

RUBBER TREADS . . . a wide choice of treads suited to all types of floors, including Darnelloprene oil, water and chemical-resistant treads, make Darnell Casters and Wheels highly adapted to rough usage.

RUST-PROOFED . . . by zinc plating, Darnell Casters give longer, care-free life wherever water, steam and corroding chemicals are freely used.

LUBRICATION . . . all swivel and wheel bearings are factory packed with a high quality grease that "stands up" under attack by heat and water. Quick grease-gun lubrication provides easy maintenance.

STRING GUARDS . . . Even though string and ravelings may wind around the hub, these string guards insure easy rolling at all times.

FREE MANUAL

DARNELL CORPORATION, LTD.

DOWNEY (LOS ANGELES COUNTY) CALIFORNIA
37-28 SIXTY-FIRST ST., WOODSIDE 77, L. I., N. Y.
36 NORTH CLINTON STREET, CHICAGO 6, ILLINOIS

ADVERTISERS' LITERATURE

Begins on page 268

Offered in ads received up to 5th of last month. To get items you want, circle numbers on Reader Service Card next to back cover.

378—Plant Sites. Analyzes industrial potential for locating plants. Bristol (Va.) Industrial Development Board.

379—Roofing. Booklet, "J-M Aquadam Built-Up Roofs," gives complete data and information. Johns-Manville Corp.

380—Panel Curtain Walls. Illustrated brochure describes structural and maintenance features. Johns-Manville Corp.

381—Window Glazing. Literature, specifications on unbreakable plastic window, skylight panels. Butler Mfg. Co.

382—Window Glazing. New glazing folder, case histories on reinforced plastic panels. Structoglas Div.

383—Rolling Steel Doors. Catalog G-59 on manually, mechanically or electrically operated doors. R. C. Mahon Co.

PRODUCTION

384—V-Belts. Bulletin M141 gives specifications and features. Manhattan Rubber Div., Raybestos-Manhattan.

385—Flexible Hose. Bulletins M694 and M610 for fluids and gases. Manhattan Rubber Div., Raybestos-Manhattan.

386—V-Belt Drives. New "Engineering Manual—Dickrope 'QD' V-Belt Drives" upon request. R. & J. Dick Co.

387—Photoelectric Equipment, Controls. Catalogs describe equipment with diagrams of applications. Autotron, Inc.

388—Steel. Booklet entitled "Value Analysis at Work." Helpful in steel-buying policies. U.S. Steel Supply Div.

389—Hydraulic Press Brakes. Catalog 2024 gives complete facts. Capacities to 2000 tons. Cleveland Crane Co.

390—Mechanical Press Brakes. Catalog 2023 (52 pages) for complete data. Illustrated. Cleveland Crane & Engrg. Co.

391—V-Belts. Informative handbook, "The Modern Way to Design Multiple V-Belt Drives." Gates Rubber Co.

392—Power Tools. Industrial power tool catalog, 52 pages. Over 100 different industrial tools. Skil Corp.

393—Speed Reducers. Catalog lists 1605 types and ratios. All are standardized stock models. Boston Gear Works.

394—O-Rings. Complete information on new seal O-ring service kit for sealing applications. Federal-Mogul Service.

Turn the page

"Slickest visual control..."

states *Factory* magazine. Entries made directly with marking pencil on a rolling "Mylar" sleeve which *moves with time,* bringing deadlines constantly closer. Entries easily erased with the swish of a cloth.

Send for **FREE GUIDE to Control Methods**
with full-scale, sample chart section

Shows how Rol-a-chart controls 22 different items: orders, production, data processing, maintenance, dispatching, sales, etc. Also expert consultation service with no obligation.

Rol-a-chart

Conley, Baltzer & Steward
494 Jefferson St., San Francisco 9
Circle 634 on Reader Service Card

REMEMBER

PALMETTO Packings pack more performance into every application

GET THEM at any industrial distributor authorized to carry Palmetto Packings . . . For the name of a supply house near you consult our insert in Thomas Register—between pages 4816-4817.

GREENE, TWEED & CO.
North Wales • Pennsylvania

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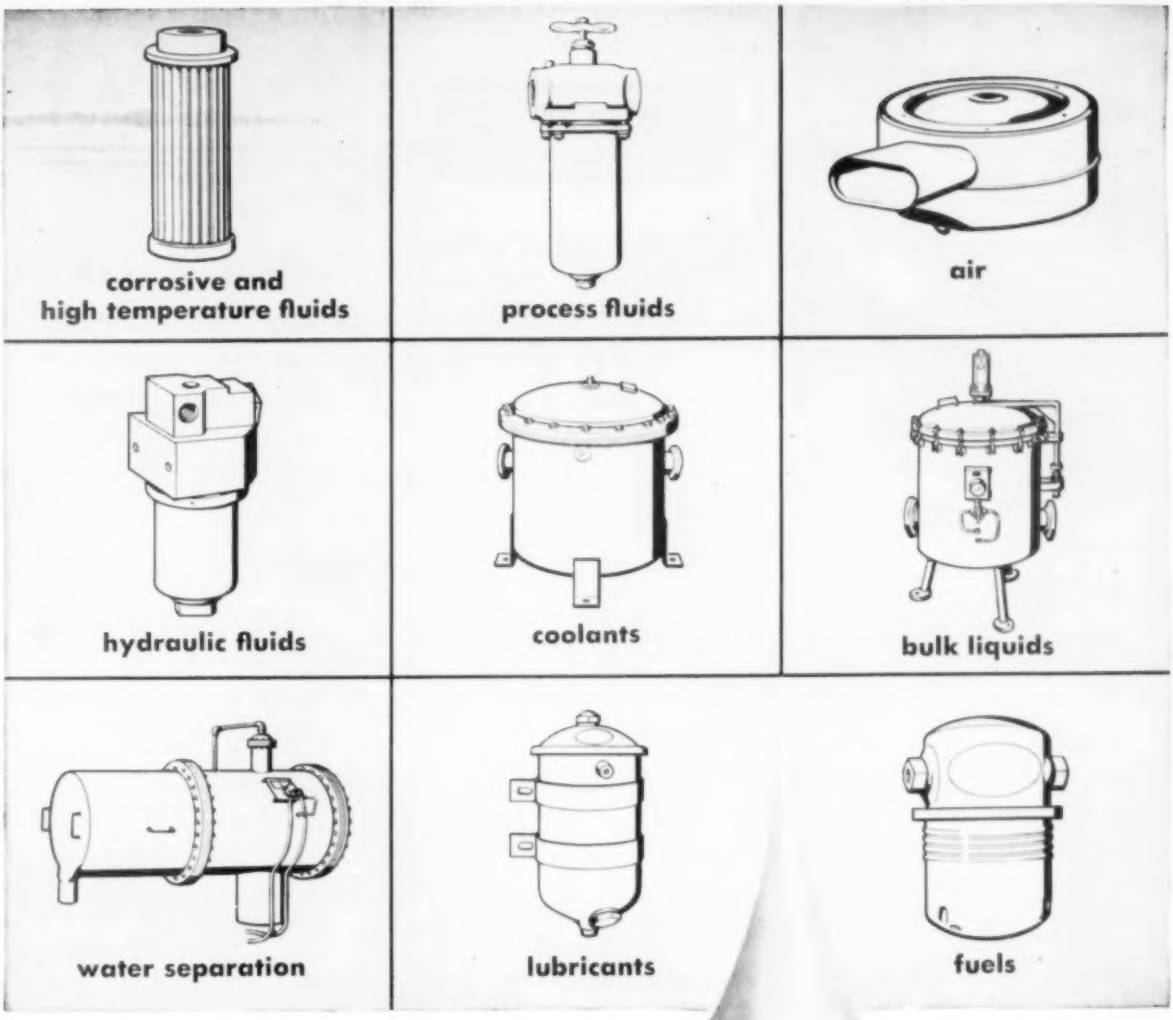
Circle 633 on Reader Service Card



There are over 2,000 filter types available right now from Purolator. Before you consider special, custom made filters, let Purolator know your filtration problem. Write Purolator Products, Inc., 970 New Brunswick Ave., Rahway, N. J., Dept. PA2-415.

There's a Purolator filter for every known fluid

Filtration For Every Known Fluid

PUROLATOR

PRODUCTS, INC.

Rahway, New Jersey and Toronto, Ontario, Canada
Agents in principal cities.

In OLD Industrial Country

Bristol, Tenn.-Va. is a vital part of the industrialized Tennessee Valley development which is one of the most diversified manufacturing areas in our country.

You'll have plenty of friendly industrial neighbors to share their experience with you and, better yet, you'll find major customers for your OEM products right among these neighbors on your own doorstep!

You see, this is OLD industrial country and it's expanding by leaps and bounds as new industry moves in to serve the old. There are important contracts for your production right here in the heart of Bristol, Tenn.-Va. Come and we'll help you investigate them.

Let Ford, Bacon & Davis Tell You the Whole Story

This nationally famous engineering firm has prepared an exhaustive analysis of Bristol's industrial potential. Write for your copy today—Dept. F1059.

Bristol
INDUSTRIAL DEVELOPMENT BOARD
of the Twin Cities of
BRISTOL • TENN. - VA.

ADVERTISERS' LITERATURE

Begins on page 268

Offered in ads received up to 5th of last month. To get items you want, circle numbers on Reader Service Card next to back cover.

395—Reproduction Materials. Free copy of booklet on reproduction materials upon request. Eastman Kodak Co.

396—Industrial Ovens. Catalog gives data and features of complete line and applications. W. W. Sly Mfg. Co.

397—Roller Chains. Book 2657, 154 pages, gives complete data, sizes and capacities. Link-Belt Co.

398—Stainless Steels. Booklet, "Engineering Properties, AM350 and AM355," on stainless steels. Allegheny-Ludlum.

399—Solvent Degreaser. Article, "Solvent Degreasing—What Every User Should Know." Detrex Chemical Industries.

400—Schedule Board. Free guide gives data and applications of visual schedule board. Conley, Balzer & Steward.

401—Hydraulic Rams. Catalog 25 gives complete data on structural features and applications. Hein-Werner Corp.

402—Temperature Controls. Helpful booklet, "Precision Temperature Control in Industrial Plants." Fenwal, Inc.

403—Magnetic Drums. Descriptive literature, installation and application information. Eriez Manufacturing Co.

404—Vibratory Feeder. Fact file gives complete data on electro-permanent types. Eriez Manufacturing Co.

405—Fluid Drives, Couplings, Clutches. Bulletins give complete descriptive data. Dodge Manufacturing Corp.

406—Pillow Blocks. Technical bulletin gives complete data, types, sizes, and capacities. Dodge Manufacturing Corp.

407—Filtration Equipment. Technical literature on protection against all oil contamination. Commercial Filters Corp.

408—Schedule Board. Bulletin X-100 shows application of visual control schedule board. Graphic Systems.

ELECTRICAL

409—Gearmotors. Syncrogear Motor Brochure F-1880 explains principle. Color-illustrated. U.S. Electrical Motors, Inc.

410—Cable. New booklet DM-5903, "Anaconda High-Voltage Durasheath Cable," free upon request. Anaconda Wire & Cable Co.

Turn the page

Automate your marking... dating... coding with the WHIPPET

Mounted on your conveyor, WHIPPET *imprints* passing cartons, neatly, without smearing. Fully automatic, self-inking, needs no operator. Printing drum adjusts for perfect registration throughout full 360°. Ends costly repair bills, usual with inferior equipment. Write today for further information to Dept. F

INDUSTRIAL MARKING EQUIPMENT Company, Inc.
ime
655 Berriman St.
Brooklyn 8, N. Y.

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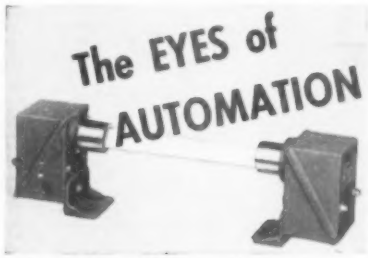


Reliable Photoelectric Controls for tension, jam-up, registration, illumination, liquid and material level – sorting, measuring, weighing, inspection—die-protection, smoke detection, packaging, processing, marking.

Heavy Duty Industrial Photoelectric Equipment
Includes normal, high speed, ultrasensitive and impulse actuated photoelectric controls—also latest tubeless photoelectric controls – with wide selection of light sources.

Catalogs describing above equipment and including diagrams of widely varied applications mailed promptly on request.

Send for your copy or tell us about your requirements.

AUTOTRON, INC.
Box 722BAM Danville, Ill.
Representatives in principal cities

Circle 639 on Reader Service Card

rugged . . .
precise . . .
easy to maintain

Westinghouse crane control

Precision built to crane-duty standards . . . long-term, low-cost service with easy operation and low maintenance costs . . . the most complete line of magnetic crane control available . . . 'round-the-clock service facilities in all areas . . . all components service-proved . . . undivided responsibility from one supplier . . . just several of the reasons why you can count on dependable, more economical service from cranes equipped with Westinghouse control. Your nearby Westinghouse salesman has all the cost-saving facts. Or, write Westinghouse Electric Corporation, P.O. Box 868, 3 Gateway Center, Pittsburgh 30, Pennsylvania. J-22145

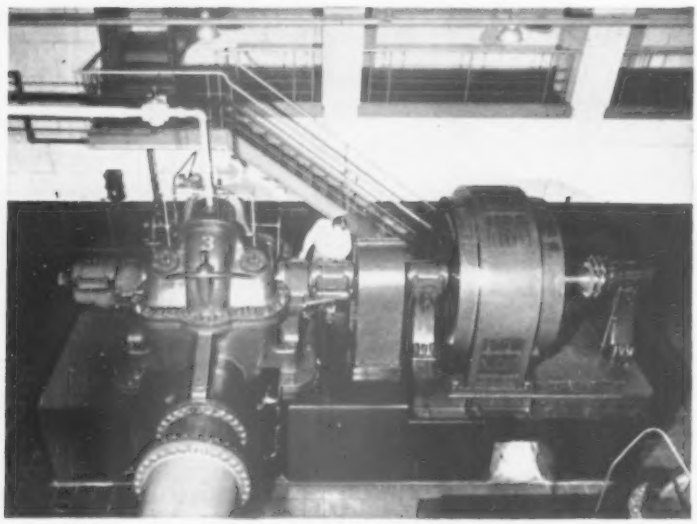
Photo above shows material bay of main carshop of Norfolk and Western Railway in Roanoke, Virginia, in which operate two twenty-five ton Whiting cranes, equipped with Westinghouse Load-O-Matic* a-c control systems, handling heavy plate and other material for car-manufacturing operation. Westinghouse Load-O-Matic crane control is ideal for applications requiring unusual stamina, ease of operation and low maintenance cost. Provides smooth, stepless speed control without the cost and complexity of d-c conversion equipment. *Trade-Mark

YOU CAN BE SURE...IF IT'S Westinghouse

WATCH WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS CBS TV FRIDAYS.

For more facts Circle 640 on Reader Service Card

A case for F-M Split-Case Centrifugals!



Typical installation in Toledo averages 80.314% wire-to-water efficiency for year!

Exceptionally high and dependable efficiency with steady, low-cost operation year after year—that's the report from a host of municipalities and industries using Fairbanks-Morse pumps in their pumping stations.

Why? Ask stations like Collins Park High Service in Toledo, O., where five Fairbanks-Morse 36-in. Split-Case Centrifugal Pumps have been giving superb performance for 17 years. The No. 3 pump in the photo pumped 6,065,590,000 gallons in one year alone, handling 26.13 percent of the plant total, and consuming just 3.55 kilowatts hours per million foot gallons!

Your Fairbanks-Morse Field Engineer welcomes you to inspect many other reports like this from his files—reports revealing why no other manufacturer can match the experience of Fairbanks-Morse in providing pumps and drivers for both municipality and industry. Your F-M Field Engineer will be glad to work with your own engineers in selecting the best equipment for your specific requirements. Write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

See Sweet's Product Design Catalog File for complete F-M Pump Line.

FAIRBANKS-MORSE

a name worth remembering when you want the BEST

PUMPS • SCALES • ELECTRIC MOTORS • DIESEL, DUAL FUEL AND GAS ENGINES
LOCOMOTIVES • COMPRESSORS • GENERATORS • MAGNETOS • HOME WATER SYSTEMS

ADVERTISERS' LITERATURE

Begins on page 268

Offered in ads received up to 5th of last month. To get items you want, circle numbers on Reader Service Card next to back cover.

411—Motors. Motor Application Guide Bulletin 270A gives details on complete line. Century Electric Co.

412—Motors. New Bulletin PB-6000-2 gives important facts about Sealedpower motors. Elliott Co.

413—Time Recorder, Totalizer. Free Brochure NR-10 gives complete information and data. Standard Instrument Corp.

414—Motor Control Centers. Bulletin SM-244 gives complete detailed information. Square D Co.

415—A-C Motors. Bulletin B-2106 gives complete facts about new a-c motor. Reliance Electric & Engineering Co.

MATERIAL HANDLING

416—Conveyor Belt. Bulletin M302 gives details and applications. Manhattan Rubber Div., Raybestos-Manhattan.

417—Conveyors. Bulletin 64 contains complete data on custom-planned Handidrive. Standard Conveyor Co.

418—Self-Dumping Hopper. Complete details on structural features and cost-saving applications. Roura Iron Works.

419—Casters. Free illustrated literature gives complete data on L-900 medium duty caster. Faultless Caster Corp.

420—Casters, Wheels. Manual lists line to meet varied applications. Mechanical features shown. Darnell Corp.

421—Electric Truck. Bulletin describes amazing 4-way directional electric truck. The Raymond Corp.

422—Industrial Trucks. Brochure describes new 3000-, 4000-, 5000-lb. trucks with Monotrol control. Hyster Co.

423—Steel Pallets. Information on high-strength steel pallets for production and storing. Republic Steel Corp.

424—Collapsible Boxes. Information on PB-127 model. Lowers cost of storage, shipment. Republic Steel Corp.

425—Drum Racks. Complete information. Each rack supports two loaded 55-gal. drums. Republic Steel Corp.

426—Batteries. Free book explains new active material for longer battery life, lower maintenance. Edison Battery Div.

427—Hoist. Bulletins fully describe combination hoist and Hoistractor for push-pull power. Gardner Denver Co.

Turn the page

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can be vastly improved with EUCLID CRANES

Crosswise mounted, low headroom, motor driven trolley hoist. Capacities to 10 tons.

Warehouse operational efficiency is contingent in no small way upon material handling efficiency.

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Semi-gantry cranes handle mill shipments and the various materials for the processing lines.

Chances are a survey by a qualified EUCLID representative may disclose an opportunity to improve your present facilities.

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greatest name in unions

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For over 55 years the firm guarantee back of each and every DART UNION sold has been — *"if one should leak through we will give you two"!* The record reveals that less than 1 in every 100,000 has proven to be faulty. The extra wide bronze to bronze seats, precision ground to a true ball joint, mounted in heavy malleable iron pipe ends and protected by an extra heavy union nut, make a drip-tight, leak-proof connection WITHOUT EXCESSIVE WRENCHING time and time again.

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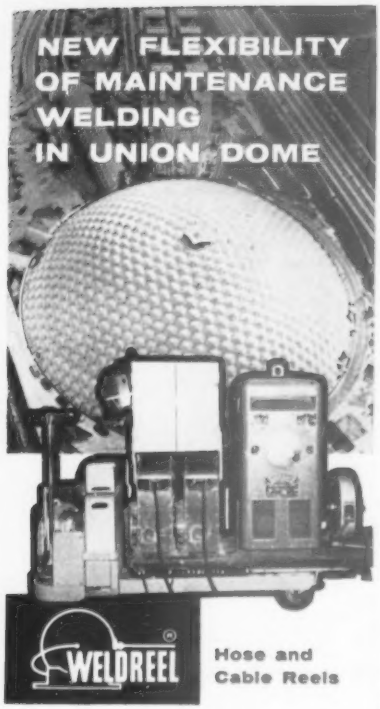

AT UNION TANK CAR COMPANY'S new maintenance facility in Baton Rouge, Louisiana, portable welding units like this one, are easily moved right up to the job site by small lift truck. Then welding cable, ground cable and welding hose are paid out as needed from WELDREEL reels.

When a job is completed, hose and cable are quickly rewound onto reels by strong springs, and the entire unit moved to a new location. Not only does this permit maximum use of welding equipment . . . *it also extends life of hose and cable* . . . keeps it off floor when not in use . . . *increases plant safety.*

Designed to handle a wide variety of single and dual hose, and single and multiple cables, WELDREEL reels are available to a wide variety of industrial applications. Write for full information.

MODEL OA-A holds 50' of 3/16" or 40' of ¼" dual hose. Model OAB has capacity for 150' of ¼" or 125' of 5/16" hose.

MODEL EA-2 with current capacity of 300 amps holds 50' of 2/0 welding cable. Model EA has capacity of 100' cable.

MODEL A-1 has 50' capacity of ¼" or ⅜" I.D. single hose. The larger Model A-2 holds 50' of ½" hose.

UNITED SPECIALTIES INC.
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276 **Circle 645 on Reader Service Card**

ADVERTISERS' LITERATURE

Begins on page 268

Offered in ads received up to 5th of last month. To get items you want, circle numbers on Reader Service Card next to back cover.

428—Wire Rope Slings. Revised, enlarged handbook gives types, dimensions, weights, etc. Union Wire Rope Corp.

429—Fork Lift Truck. Certified job studies and specifications in folder GSS, upon request. Towmotor Corp.

430—Wire Rope. Brochure describes features of new herringbone-type wire rope. John A. Roebling's Sons Corp.

431—Crane Control. Bulletin 6131 gives details about remote magnetic controls. Electric Controller & Mfg. Co.

432—Electric Truck. Folder on new Titan series. 5 models—12,000 to 20,000 pounds. Elwell-Parker Electric Co.

433—Hydraulic Jacks. Catalog 101 gives complete details. Capacities 1½ to 100 tons. Hein-Werner Corp.

434—Scales. Bulletin 2968 on check-weighers. Two models (5-50 lb. and 50-200 lb.). Toledo Scale Div.

435—Bulk Weighing Scales. Bulletin 2490 on automatic weighing-in truck for carload shipments. Toledo Scale Div.

436—Palletainers. New catalog, profusely illustrated with specifications, construction details. Union Steel Products.

STORAGE, CONTAINERS

437—Storage Racks. Folder gives complete data on open-end adjustable storage racks. American Metal Products Co.

438—Storage Racks. Fully descriptive literature on wedge-lock parts storage units. Republic Steel Corp.

439—Paper Bags. Booklet CP-1 describes dozens of ways to cut costs in shipping. Union Bag-Camp Paper Corp.

440—Steel Shelving. Reference Manual 485, free booklet, "How to Solve Your Storage Problems." Equipto.

For good ideas . . .

. . . write for a free list of FACTORY reprints to help you with your management problems. Select the titles you want, then order them from FACTORY Reader Service, 330 W. 42 St., New York 36.

ask your driver about MOBILIFT

and the stand-up model's 360° steering . . . he'll tell you it means less aisle space needed for him—and means more storage space for you.

Look us up in the Yellow pages or write today for further details!

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MICRO LEVER DOLLY

a low cost safe tool to move heavy objects

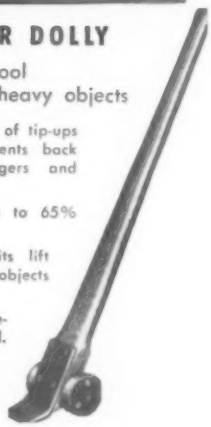
Eliminates the danger of tip-ups and high falls. Prevents back sprains, crushed fingers and pulled muscles.

Cuts moving time up to 65% on large bulky items.

Correct design permits lift blade to pry under objects flat to the floor.

High leverage ratio between power and load.

Four sizes. Metal or rubber wheels. See local distributor or write to—



MICRON, INC., Bettendorf, Iowa

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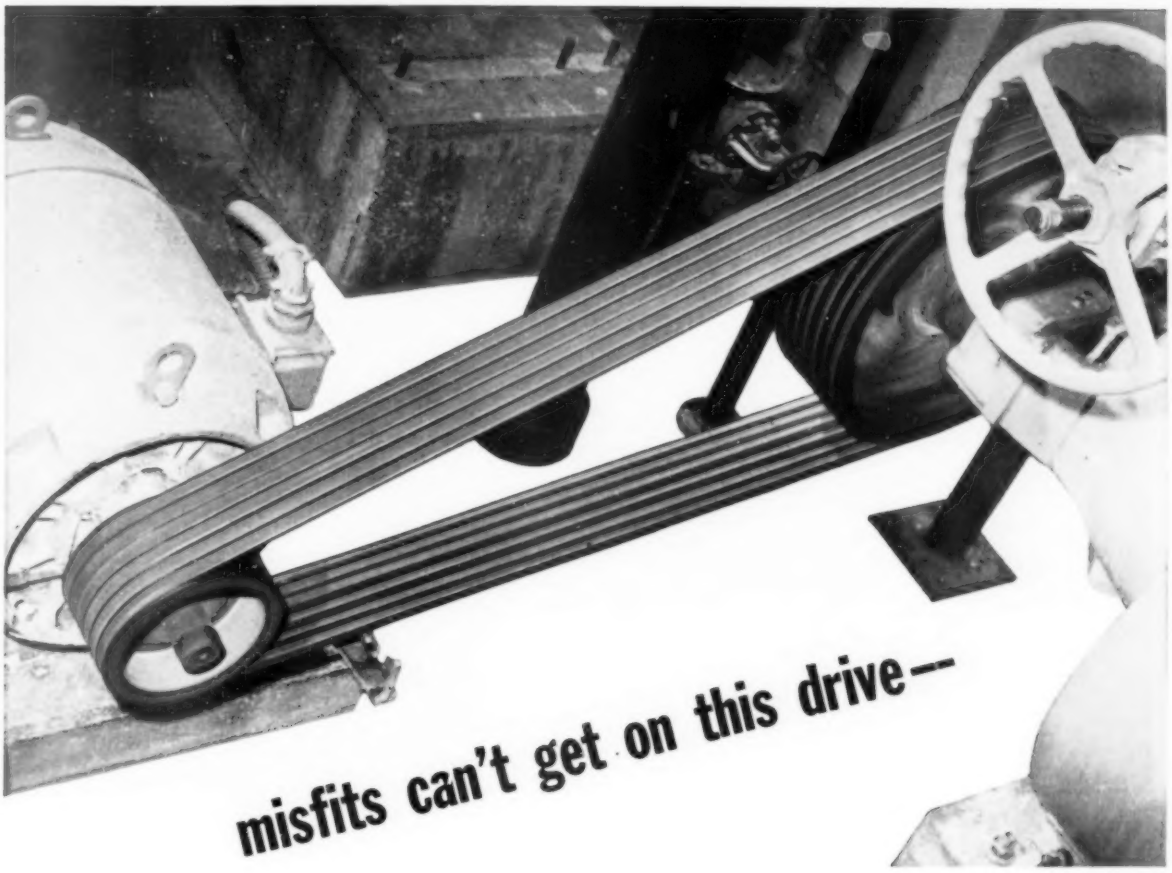
ROYAL V-BELTS



THE BELTS ARE U.S. ROYAL

The above drive in the plant of a large paper manufacturer proves again the perfect matching of U. S. Royal V-Belts. They are *born matched . . . and stay matched.*

This matchability has been demonstrated again and again with U. S. Royal V-Belts from Maine to California. You can call any U. S. V-Belt Distributor, specify the belt size and then receive belts of perfect match without delay. Why? Because the distributor serves you immediately from stock, is freed from the time-wasting job of putting belts (in all sizes up to 180") on a matching machine. Rejects just don't happen.

U. S. Royal V-Belts excel because they are made by entirely new methods of curing, they have new pulling members, new jackets incorporating new technical advances in rubber.

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Planning an air tool application to step up your production . . . and lower costs? Your nearby Aro Distributor will gladly give you expert on-the-job assistance!

His broad experience and factory training can solve most air tool problems *pronto*. And he's ready to fill your order off-the-shelf on many Aro items. You can also count on him for efficient service and parts when needed. ARO is proud to bring its precision-quality products to you through this fine Distributor Organization. Ask your Aro Distributor now "What's new in Air Tools"? Write for full-line catalog 63.

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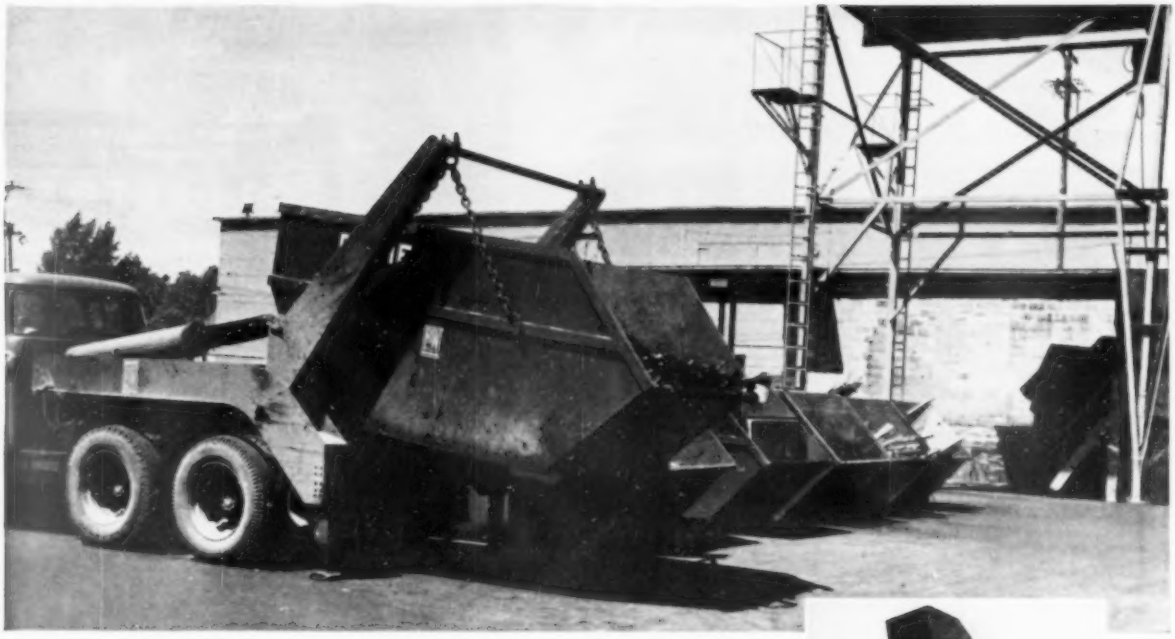

Clean, orderly scrap collection areas like this are provided by The Load Lugger System.

Good Housekeeping doesn't cost - - it pays!

Neat, orderly premises pay off in greater plant efficiency, safer operating conditions, better employee morale—as good plant operating men know.

THE LOAD LUGGER SYSTEM can reduce your plant housekeeping costs as much as one-half. Big Load Lugger containers* spotted in scrap collection areas, at rubbish accumulation points and adjacent to the plant cafeteria eliminate drums, boxes, messy garbage pails, and the cost of several men to handle them. One man and a Load Lugger truck can do the job in a fraction of the time. One truck can service scores of containers.

Many industrial plants and commercial institutions are getting good housekeeping results with the versatile Load Lugger system, and at less than the cost of other methods. Why not draw on our experience in solving their housekeeping problems? We'll make practical recommendations. You've everything to gain, nothing to lose. WRITE TODAY.

*Capacities 1½ to 16 cubic yards.

Load Lugger truck dumps big container at disposal site. Container will be returned to its station for refilling. One truck, one man, accomplish more than a dozen trucks and men can by other methods.

This leak-proof, vermin-proof container simplifies garbage and refuse disposal at a plant cafeteria, keeps litter from being blown about.

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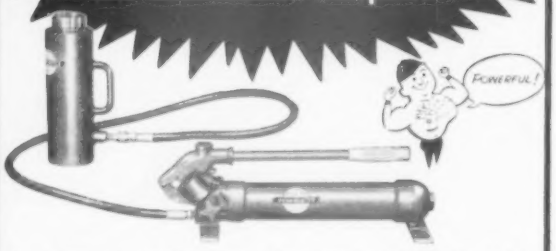
HYDRAULIC PUSHMASTER RAMS save you valuable production time and maintenance manpower!



You effect substantial time and labor economies by standardizing on powerful Hein-Werner PUSHMASTER Hydraulic Rams. Built to make tough production, materials handling and maintenance jobs easier and safer. Positive, controlled pushing power for lifting, bending, pressing, leveling and straightening. Include safety valve, Quick Coupler and provision for gauge attachment; hand or motor actuated; double sealed with neoprene Quad-Ring to prevent leakage. Available in capacities of 4, 10, 20, 30 and 60 tons. Standard thread interchangeability on 10 and 20 ton models. One-piece, leakproof body construction on 30 and 60 ton models. Mail coupon for catalog No. 25, or see your Hein-Werner industrial distributor.

You can't beat a

HEIN-WERNER HYDRAULIC JACK

- *top quality construction*
- *trouble-free lifting performance*
- *safe, controlled power*

Hein-Werner Hydraulic Jacks in capacities from 11/2 to 100 tons offer these unique features: one-piece extension screw, massive top nut with doubled bearing surface for ram, neoprene Quad-Ring seal molded to closer tolerance for better sealing action, unbreakable handle socket, longer-lasting "Heinite" piston, direct release valve, pre-formed leather ram cups, larger, heavier base. Mail coupon for catalog No. 101, or consult your Hein-Werner industrial distributor.

Hein-Werner CORPORATION
WAUKESHA, WISCONSIN

Hein-Werner also supplies industry with a complete line of portable hydraulic Tal Benders in ranges from 1/8" to 8" and "Push & Pull" Double-Acting Hydraulic Jacks and Attachments in 4, 10 and 20 tons capacity.

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1200 National Avenue, Dept. 112
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Please rush me the catalogs checked:
- ☐ No. 25 on PUSHMASTER RAMS
- ☐ No. 101 on Hydraulic Jacks
- ☐ No. 35 on portable TAL BENDERS
- ☐ No. 10 on PUSH & PULL HYDRAULIC JACKS

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WASTE
RECEPTACLES
Cleanliness is automatic by conveniently placing Bennett Waste Receptacles to invite their use. Yes, "litter bugging" is eliminated with these easy-to-use, sanitary and economical waste receptacles. Put them to work reducing your cleaning costs and increasing neatness.
Wherever people gather there is a logical location of Bennett Waste Receptacles America's most complete line including self-closing and drop-in models. Write today for catalog and prices.
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BENNETT SELF-CLOSING WASTE RECEPTACLES available in 12 models
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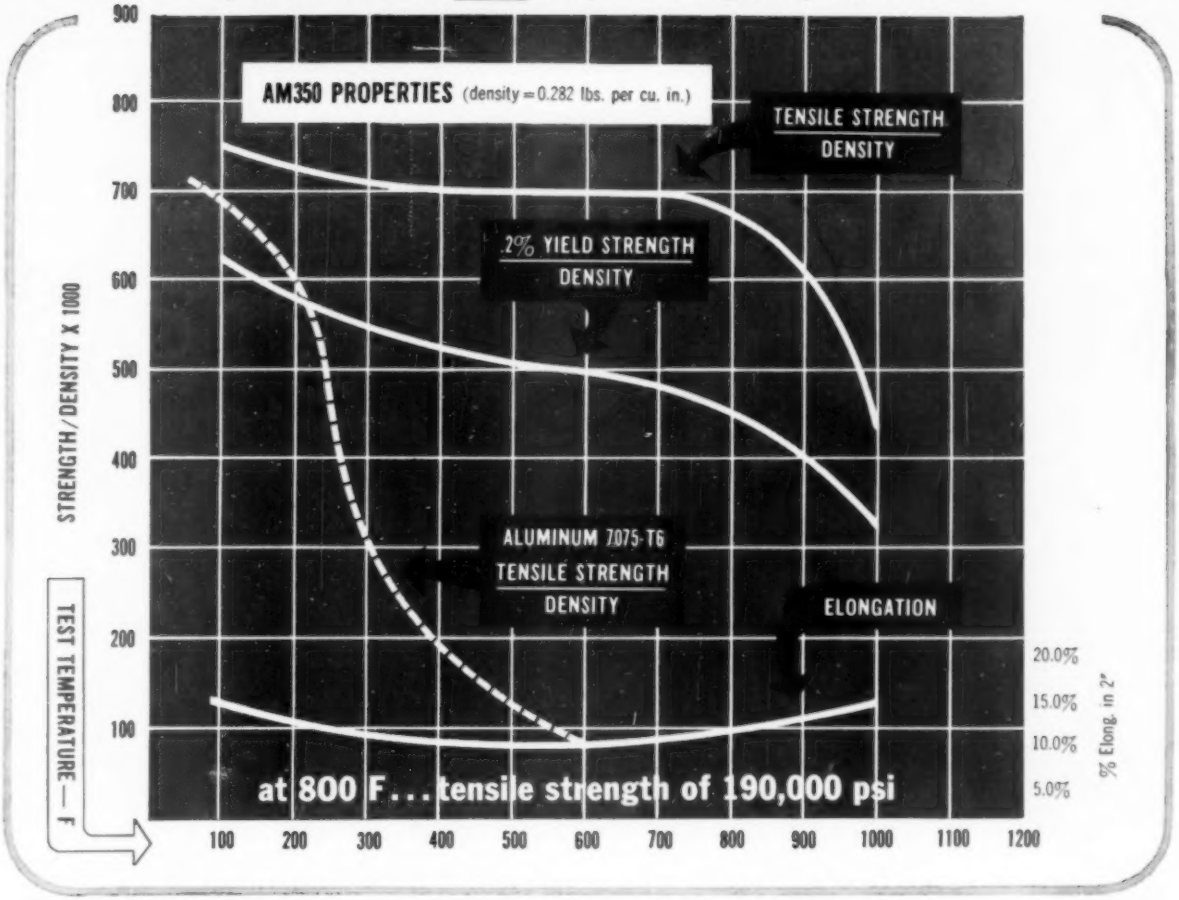
Experience**—the extra alloy in **Allegheny Stainless



Here are the facts on AM350 and AM355, Allegheny Ludlum's precipitation hardening stainless steels

A unique combination of highly desirable properties is the usual description of Allegheny Stainless AM350 and AM355 Steels. They combine high strength at both room and elevated temperatures, excellent corrosion resistance, ease of fabrication, low temperature heat treatment, good resistance to stress corrosion.

They are proving the answer to many problems of the air age. Airframe and other structural parts, pressure tanks, power plant components, high pressure ducting, etc. are all natural missile and supersonic aircraft applications for AM350 and AM355.

Availability: AM350, introduced several years ago, is available commercially in sheet, strip, foil, small bars and wire. AM355, best suited for heavier sections, is available in forgings, forging billets, plate, bar and wire.

Corrosion resistant: Being stainless steels, these alloys resist corrosion and oxidation. Compared to the older, more familiar stainless grades, their corrosion rating is better than the hardenable grades (chromium martensitic) but generally less than the old corrosion resistant standbys, the 18 and 8's. Stress corrosion is resisted at much higher hardness levels than with martensitic stainless.

Simple heat treatment: High strength is developed by two methods, both involving less than ordinary temperatures and minimizing oxidation and distortion problems. The most popular, and one that develops slightly better properties, is the Allegheny Ludlum developed sub-zero cooling and tempering (SCT condition). The material is held at minus 100 F for 3 hrs plus 3 hrs at 850 F. Alternate method is Double Aged (DA): 2 hrs at 1375 F plus 2 hrs at 850 F.

Easy fabrication: AM350 and AM355 can be spun, drawn, formed, machined and welded using similar procedures as with the 18-8 stainless types. In the hardened condition (SCT & DA) some forming may be done . . . 180 degree bend over a 3T radius pin. Also it can be dimpled in the hard condition to insure accurate fit-up.

For further information, see your A-L sales engineer or write for the booklet "Engineering Properties, AM350 and AM355." ***Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.*** Address Dept. F-22.

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THE WORLD'S MOST COMPLETE LINE

SIMPLEX LEVER JACKS

SINGLE ACTING, RATCHET LOWERING

11 Models, 5 to 20 tons capacity. Full capacity on toe or cap.

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2 Models, 15 tons capacity. Pivot on base.

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3 Models (One aluminum alloy) 5 to 15 tons capacity. Standard of Bell System.

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what TRT is — An instrument that automatically records "on-off" time of **any machine or process.** Information is marked on a continuous, time-indexed tape. Marking stylus is electrically actuated. Tapes run 4 months.

what TRT does — Shows on tape **exactly when** "down-time" occurs, how long it lasts. Access window enables operator to write reason for stoppage. Visual counter totals **actual productive time.**

how TRT saves — TRT data-on-tape gives accurate, single-source basis for **cost-cutting** in plant or office: time study, production control, preventive maintenance, locating bottlenecks. Write for free Brochure NR-10

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Bostitch shows metal fabricator how to increase production 33%—cut costs 18%—with stapling

A Warwick, Rhode Island, manufacturer used screws or rivets to join the top and side of triple-track aluminum windows.

A Bostitch Economy Man suggested stapling. Results—production rate rose by a third and manufacturing cost fell 18%. Bostitch staplers eliminated the pre-drilling needed with former method. Stapling is a split-second, single-motion job. And the staples themselves cost less than the fasteners formerly used.

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assurance of the right combination for your needs from 800 staplers and over 200 staples . . . an extra margin of quality . . . nation-wide parts, service and technical aid . . . dependable supply from the industry's most modern factory . . . and we stand behind every Bostitch machine, making sure it operates to your complete satisfaction.

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to fasten _____ (material and item)

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Company _____
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City _____ Zone _____ State _____

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low maintenance
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The giant steelman is the Image of CF&I. He represents a rigid system of checks and quality controls which build *dependability* into such steel products as Realock Chain Link Fence.

An ever-alert "watchman", Realock Fence prevents wanton damage to plants and factories...stops burglary of material and equipment stored outdoors . . . is a safe, sure way to isolate "off limits" areas.

Made of specially selected steel, Realock's fabric is galvanized *after* weaving to resist weather and corrosive fumes. It keeps its attractive appearance for many years, requiring only a minimum of maintenance. And Realock's sturdy posts are set in concrete to prevent sagging. Realock crews will erect your fence or your own plant personnel can install it. Choice of steel or aluminum fabric.

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New NIBROC® ZIP-TOP CARTON

just grab tab and...zip!

FAST! EASY! CLEAN!

SAVES TIME AND TEMPER!

SAVES FINGER NAILS!

SAVES CARTONS FOR RE-USE!

Now . . . all NIBROC Towels come in the time-saving ZIP-TOP Cartons at no extra cost! No tearing or slashing of carton—they zip open with an easy pull and close again neatly to keep your NIBROC Towels sanitary. Ask your dealer about NIBROC Hi-Dry Quality Towels in the new, easy-open carton.

SEND TODAY for samples, complete information, and a set of 8 Washroom Posters that will help you reduce maintenance costs. For the name of your nearest Nibroc Dealer, see "Paper Towels" in the Yellow Pages.

BROWN COMPANY
Dept. NC-10, Towel Sales Division
150 Causeway St., Boston 14, Mass.

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FREE!
New Floor and Carpet Care Manual

This colorful manual will help you solve most any floor and carpet maintenance problem. It contains illustrated, step-by-step instructions on how to clean and maintain 10 different types of the most popular hard and resilient floors. It tells how to shampoo carpets; how to select proper equipment, cleaners, waxes, and finishes; how to treat common floor failures. It also contains suggestions on floor safety, tips on floor and carpet stain removal, and explains how to set up proper job time requirements and use work planning schedules.

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CONVERTAMATIC
Cleans 15,000 sq. ft. of floor per hour. Lays solution, scrubs, vacuums, and dries—all in one operation.

SCRUBBING AND POLISHING MACHINES
Heavy-duty floor machines for scrubbing, polishing, steel-wooling, sanding, grinding, and carpet shampooing. Brush sizes from 12" to 24".

WET-DRY VACUUM CLEANERS
Picks up both wet and dry materials. For heavy-duty cleaning where powerful vacuuming is needed. Available in 5, 8, 12, 16, and 55 gallon sizes.

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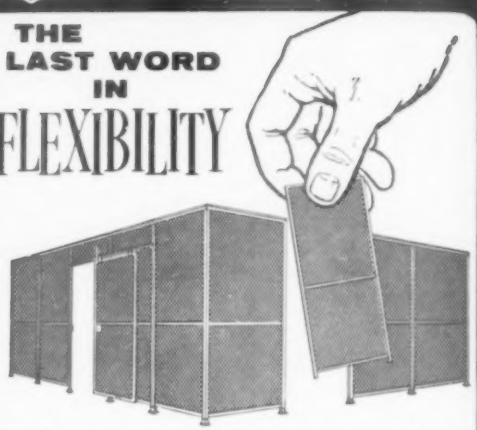
THE LAST WORD IN FLEXIBILITY



WIPCO woven-steel wire partitions are designed to fit any area, regardless of height, location of doors and other openings, etc. Easy and economical to erect, your own men can put them up without outside help! Use them over and over again, salvaging each individual section for use in new erections. Available in *standard* sections from stock—or *custom-built* for any requirement, WIPCO partitions are easy to paint and clean—require little or no maintenance! For increased efficiency and flexibility at lower cost, get the facts on WIPCO wire partitions!

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MEN WHO KNOW THE FACTS save their firms ½ the cost of storage racks!

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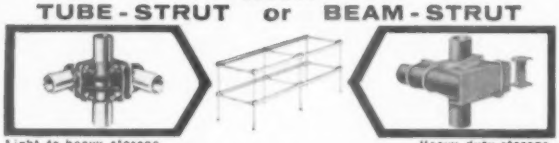

Light to heavy storage. Heavy duty storage.

THE UNIVERSAL CLAMPS

outmodes costly prefabricated racks— use either standard channel, I-beam or pipe

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YOU WILL RECEIVE:
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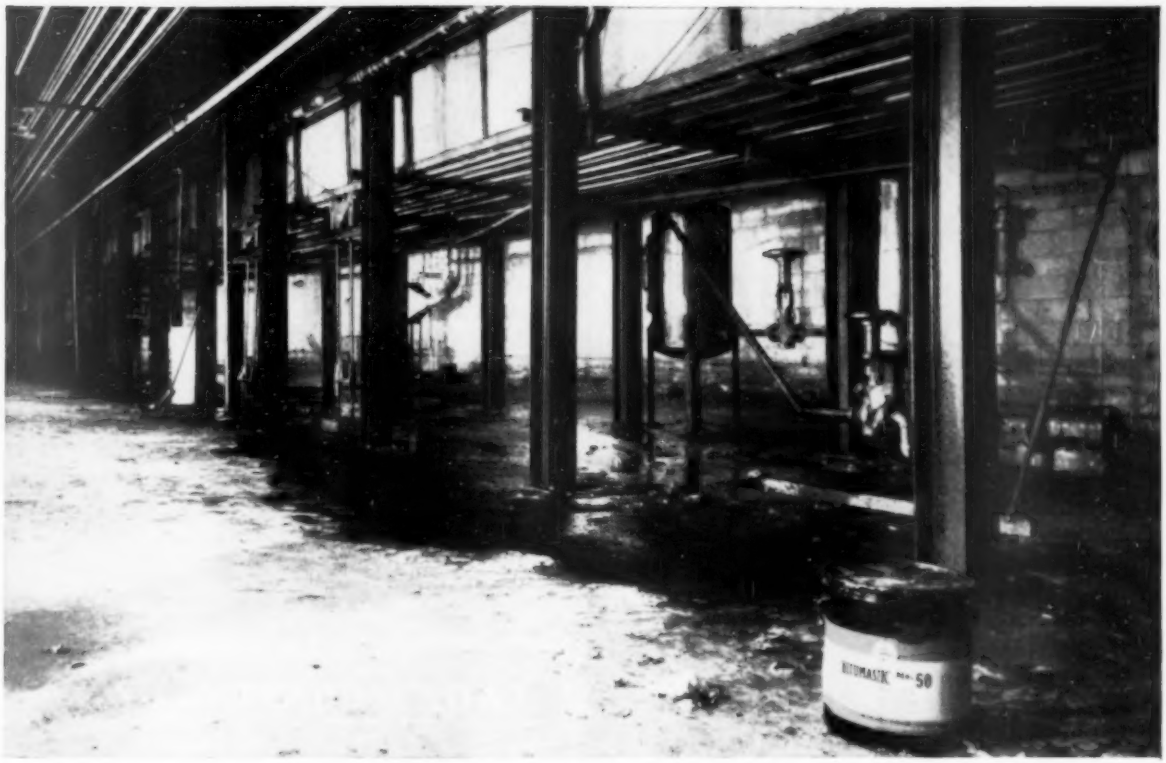

Thomas S. San Giacomo, president of Cornwall Paper, Orange, N. J., says:

"Paper mill atmospheres are tough on coatings but Bitumastic No. 50 can really take it."

Seven years ago, Cornwall Paper Mills Corporation's corrugated board and chipboard plant at Cornwall, N. Y. had a corrosion problem common to paper mills: processing fumes in a highly humid atmosphere that quickly attacked ordinary coatings on steelwork and processing tanks.

Then Cornwall switched to Bitumastic No. 50, the Bitumastic coating with 20-25 mils dry-film thickness per coat, in an effort to prolong periods between re-coating. As Mr. San Giacomo says, "Bitumastic No. 50 has given us excellent service. Interior structural members, tanks, piping and a large water tank were given two coats. Our Bitumastic coating system is still in fine condition after 7 years and no re-coating is needed."

Cornwall has ordered the same heavy-duty protection of Bitumastic No. 50 for all metal surfaces in its plant addition, presently underway, which will increase the firm's capacity 25%.

Your corrosion problem may not be the same as a paper mill's . . . but the protection and long-life offered by coal-tar based Bitumastic coatings can save you expensive painting maintenance, too. There's a coating in the Bitumastic line for every industrial application. Call your nearby Bitumastic distributor for further information, or return the coupon. Koppers Company, Inc., Tar Products Division, Pittsburgh 19, Pennsylvania. District Offices: Boston, Chicago, Los Angeles, Pittsburgh, New York and Woodward (Birmingham), Ala. In Canada: Koppers Products, Ltd., Toronto, Ont.

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COATINGS AND ENAMELS

another fine product of COAL TAR

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the true door — not a curtain,

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RUBBAIR® DOORS Assure Trouble Free Operation With

- Flexible construction
- Safety-cushion nose
- Scuff-resistant wear panels
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- Positive air seal
- Shatter-proof windows

If you have an industrial door maintenance problem, let us help you solve it. Write us the details or send for a free illustrated catalog.

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SEE PAGE 298A

THIS ISSUE

Eyes Are Expensive Targets

THE AVERAGE EYE INJURY COSTS INDUSTRY $6.00 PER PRODUCTION WORKER PER YEAR...THAT'S MORE THAN TWICE AS MUCH AS THE AVERAGE COST OF THE SAFETY GLASSES THAT PREVENT INJURY

*In some cases over $100,000 annually

Write for your copy of new brochure "Eyes are Expensive Targets." Shows how America's leading companies are saving workers' eyes (and skills) and thousands of dollars* annually.

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SAFETY PRODUCTS DIVISION
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Safety Service Centers in Principal Cities

Always insist on Trademarked Lenses and Frames

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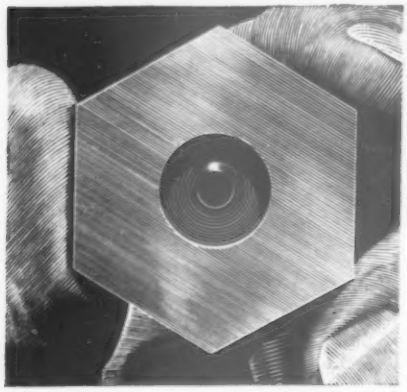
Here's something you've never seen before!



NEW Carrier "CANT-CLOG" SPRAY NOZZLE

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Proved in more than three years of service as standard equipment on Carrier air washers, this revolutionary new centrifugal type spray nozzle is now available as a replacement on all makes of spray equipment—as caps only or complete nozzles.

It's self-cleaning. It installs in seconds. It's low in cost. And since the orifice is formed in a flexible Buna-N rubber dome, erosion normally caused by restricting particles is eliminated. You get longer nozzle life, less down-time and better equipment performance.

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Carrier

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world's most respected motor

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In Canada: Brook Electric Motors of Canada, Ltd. 250 University Ave., Toronto, Ontario

BROOK MOTOR CORPORATION

For more facts Circle 670 on Reader Service Card

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YOU KNOW YOU ARE GETTING WHAT YOU ORDERED

67.32% NEOPRENE TYPE W S COND #8

HIGHEST NEOPRENE CONTENT IN THE INDUSTRY to give your cable maximum protection from oil, heat, acid, abrasion, etc.

TYPE AND SIZE are molded* into the jacket as well as rated voltage & "P116BM," Bureaus of Mines official approval number.

SELF-MEASURING—Branding* is repeated every two feet exactly. Want 20 feet? Count 10 Broncos and cut.

Write for free sample!

*U.S. PATENT #2867001

WESTERN INSULATED WIRE CO., LOS ANGELES 58, CALIF.

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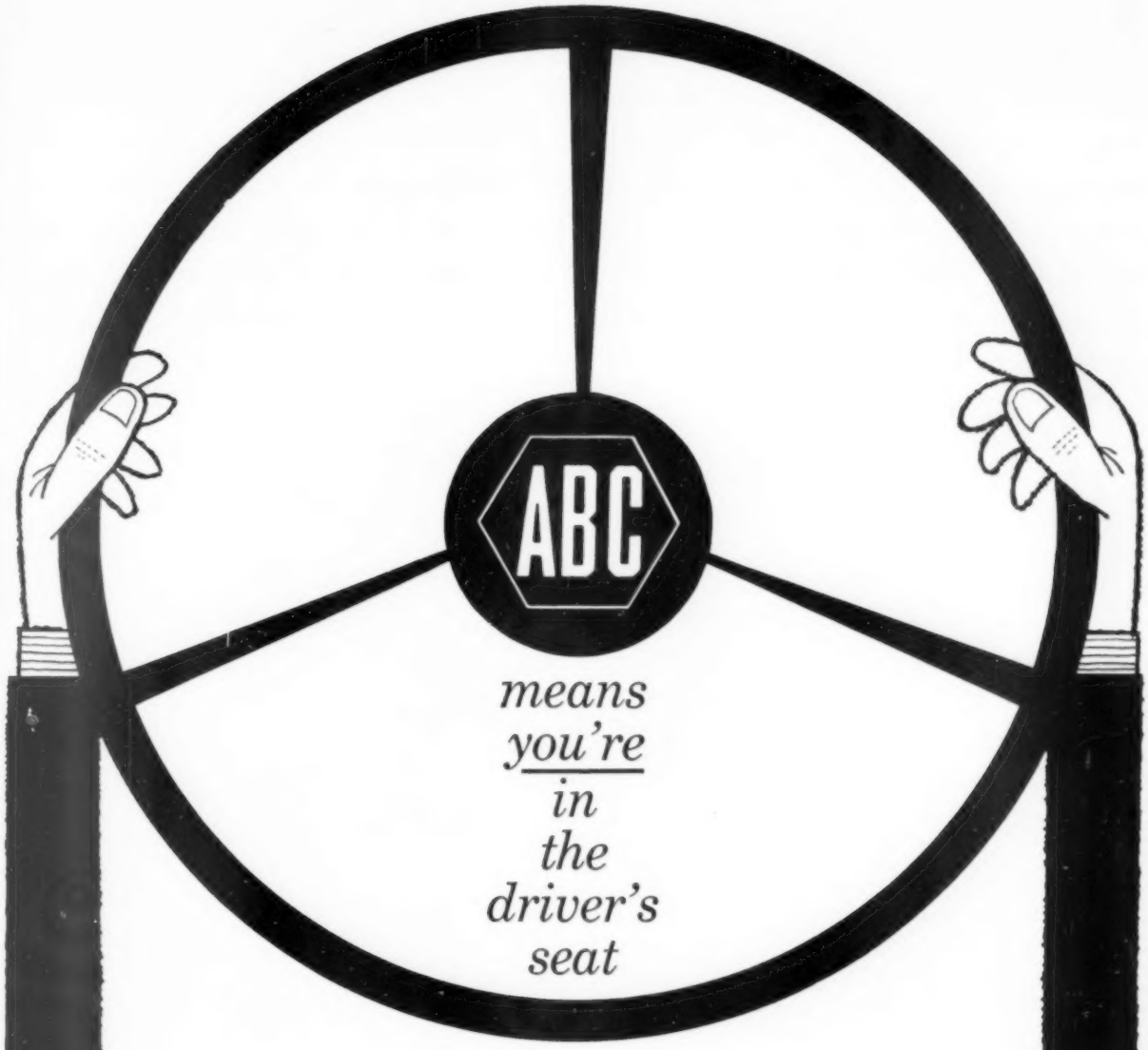

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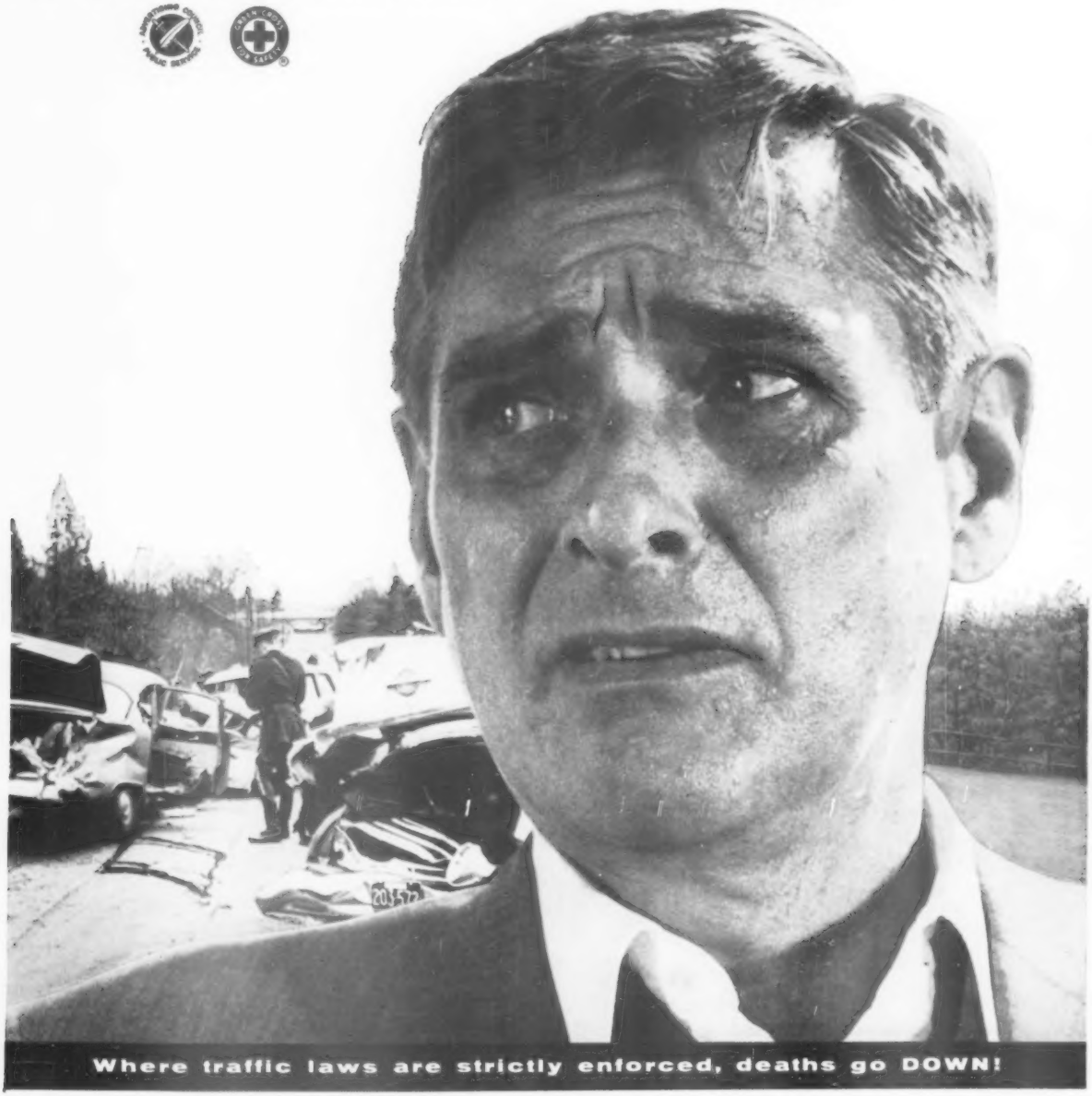

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think "SEARCHLIGHT" FIRST

For that extra margin of Safety . . .

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For information on how to specify the Blaw-Knox Electroforged Steel Grating best suited to your needs, write for your copy of Bulletin 2527-R.

BLAW-KNOX COMPANY

BLAW-KNOX

Blaw-Knox Equipment Division
Dept. B, Pittsburgh 38, Pa.

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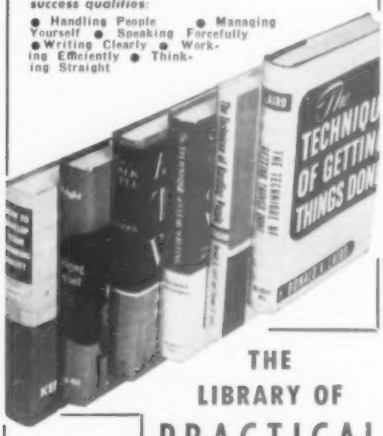

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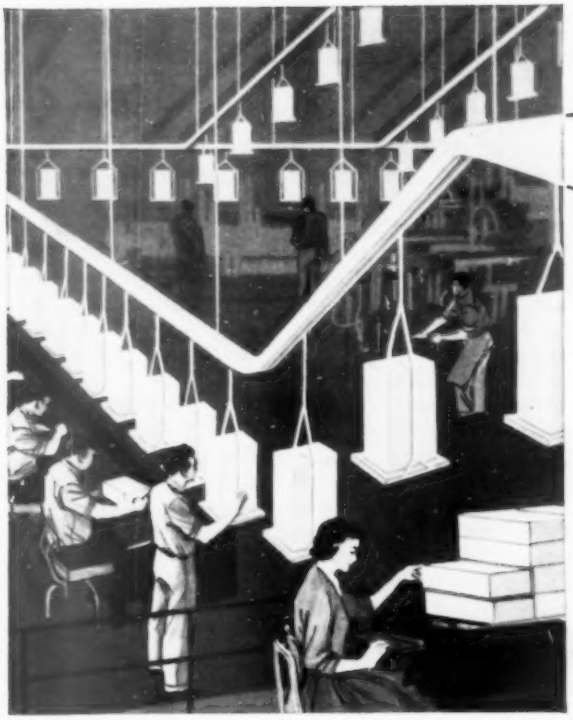

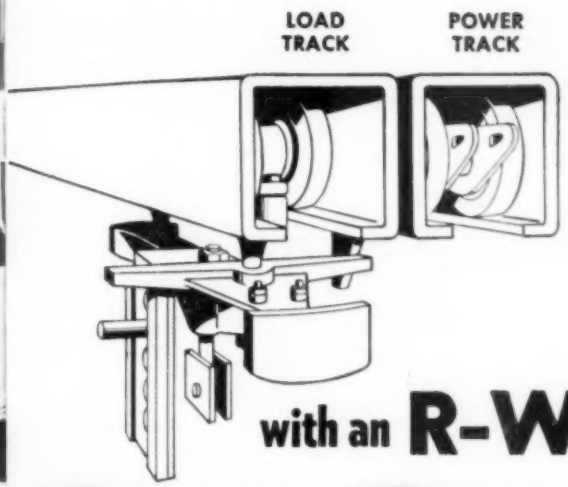

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FACTORY . . . PUBLISHER'S LETTER

Coming in November:

Modernization Case Book

Next month, FACTORY will have completed a full circle of editorial coverage on the theme of "Managed Modernization." As you can see from the photos at left, we started last November with what was really the basic text on modernization principles. We covered the need, the approach, and the methods—including even guidance on the best way to sell modernization ideas up the line.

Then we went on with the proof of the pudding—a ten-month program (skipping only May, our Top Plants issue) devoted to showing "Managed Modernization at Work." Here our aim was to present in really useful detail outstanding examples of what is actually now being done to make modernization pay off in practice.

Now we're coming up to what we feel is the climax of this program, with a massive collection of over 500 modernization ideas in the November issue. The cover (bottom picture, left) shows the wide range of subject matter we'll be dealing with. But only a careful study of the November issue itself will reveal to you the full impact of all the months of work our editors have put into this special project.

Why are we doing this, right at this time? Because we have never seen a time when we felt modernization help would be of greater importance or greater urgency. Everywhere we turn we see modernization problems and a growing realization of the important pay-offs that smart solutions to these problems can yield. And we're not kidding ourselves about the kind of pay-off, either. It must be in cold dollars and cents because that's what today's cost pressures demand.

Actually, when we take this hard-boiled attitude, modernization is just about the only good weapon left against constantly rising costs. It's in tune with the economic times.

How do we know it's "in tune"? Because our own McGraw-Hill Department of Economics has made a special survey of this very problem in which it found that it would cost over $33-billion to replace all facilities that manufacturing companies (excluding petroleum and refining) consider obsolete. Our economists also point out, however, that depreciation deductions estimated for manufacturing companies for the 1959-1962 period will total more than $35-billion. Thus the flow of depreciation money during the next four years will be enough to replace all the facilities now considered obsolete.

This is a vitally important economic point—for you and for your companies. What it means is that, in the aggregate, *you will have available the money you need* to do the modernization work that you need to do.

So we are not talking in idle academic terms when we say that modernization is in tune with the economic times. We *know* that the money will be available. What we are hoping we can do for you is to feed you ideas on the best ways in which to spend it.

Donald H. Hoblitzelle

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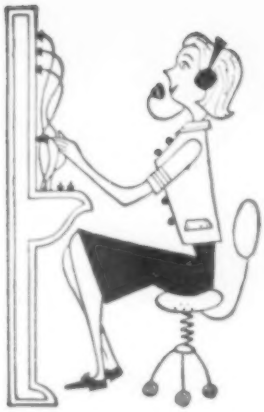

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5—Vertical Air Compressor
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7—Oil-Gas Burners
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9—Air Motors, Controls

ELECTRICAL

10—Power Switching Centers
11—Inverter-Diverter Power System
12—Fluorescent Floodlights
13—Silver-Cadmium Batteries
14—Radioactivity Monitors
15—Packaged Transformer
16—Brushless Generators
17—Underfloor Wiring
18—Gearmotors
19—Reduced Voltage Starters

BUILDINGS

20—Windows and Walls
21—Radiant Heat Construction
22—Fire-Alarm Systems
23—Cooling Towers
24—Make-Up Air
25—Grade Crossing Pads

PRODUCTION

26—Grinding Wheels
27—Turret Drilling Machines
28—Spiral Point Drilling
29—Indexing Tables
30—Liquid Spray Buffing
31—Flame Cutter
32—Automatic Production Lathes
33—Descaling Machines
34—Eyelets and Eyeleting
35—Stud Welding
36—Inventory Control
37—Marking Machines
38—Electronic Tracer
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41—Welding Equipment

MAINTENANCE

42—Safety Products
43—Power Floor Sweepers
44—Heater Tube Protectors
45—Arc Welding Accessories
46—Blower Vacuum Cleaners
47—Metal Cleaning
48—Spring Clutches

INSTRUMENTS AND CONTROLS

49—Air Measuring
50—Process Controls
51—Time-Cycle Controls
52—Process Instrumentation
53—Hydrostatic Measurement

MATERIAL HANDLING

54—Rope and Slings
55—Dumping Equipment
56—Fork Trucks
57—High-Speed Weighing
58—Fiber Containers
59—Warehouse Layout
60—Handling Units
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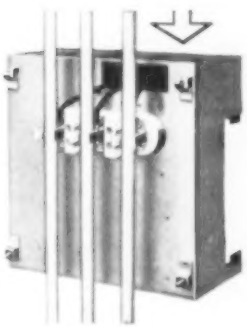

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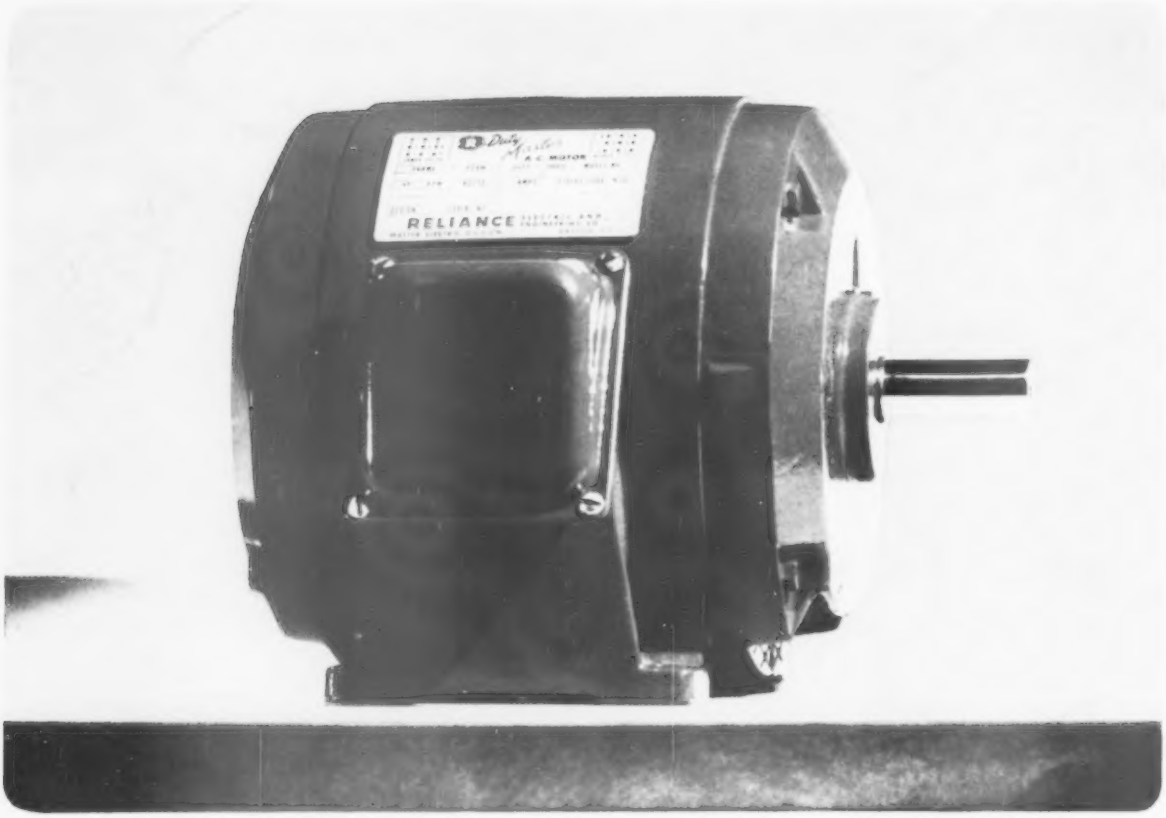

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